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THE INSTITUTION OF PRODUCTION ENGINEERS

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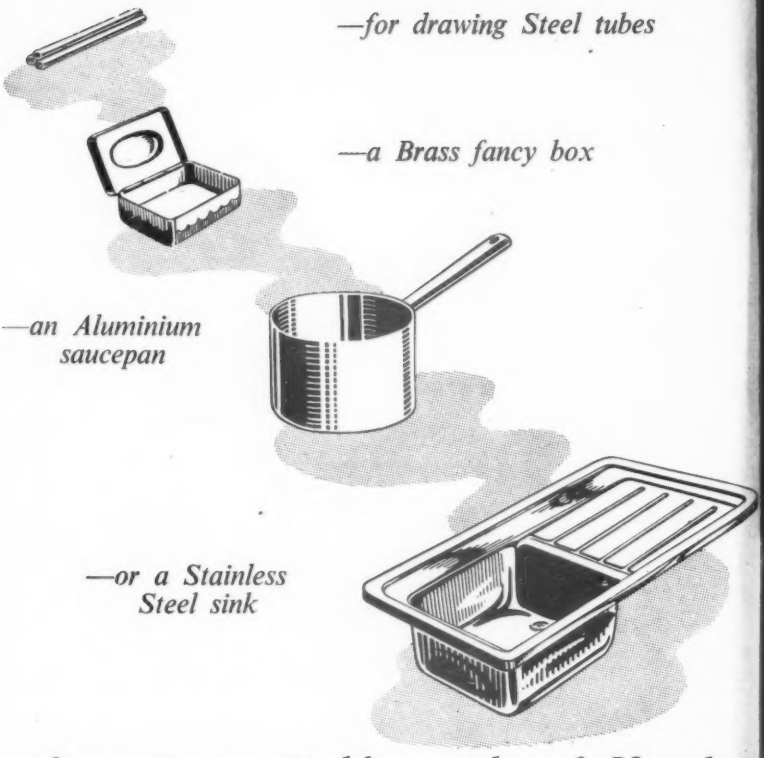

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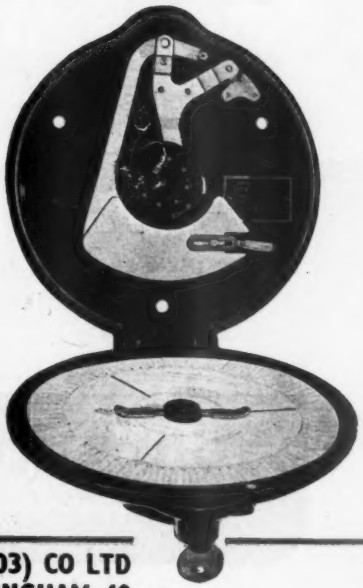

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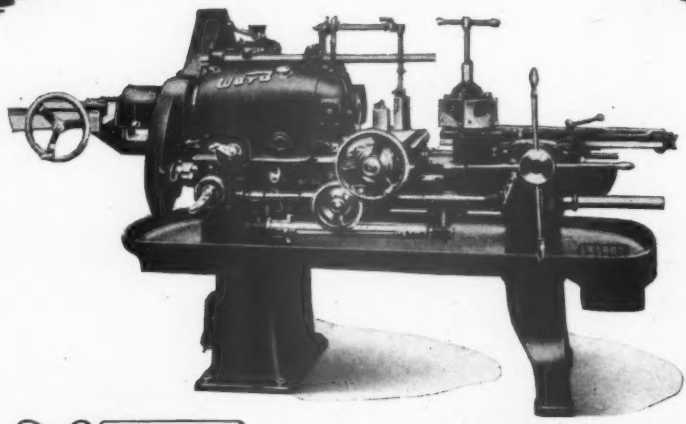

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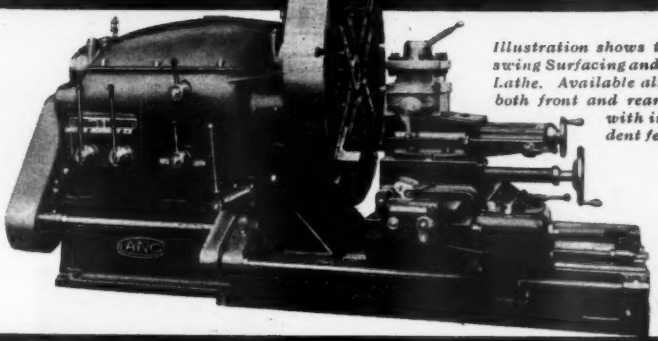

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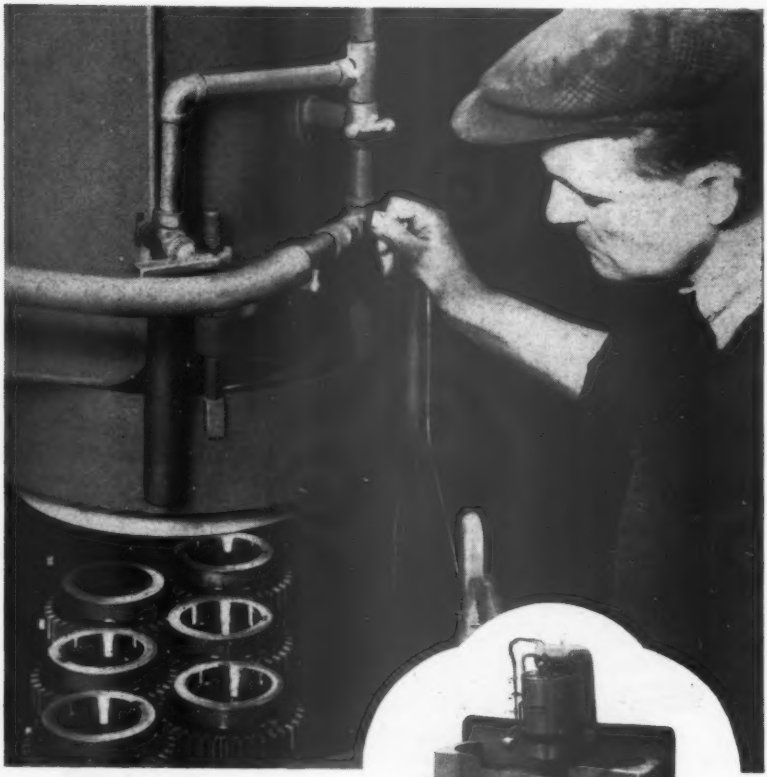

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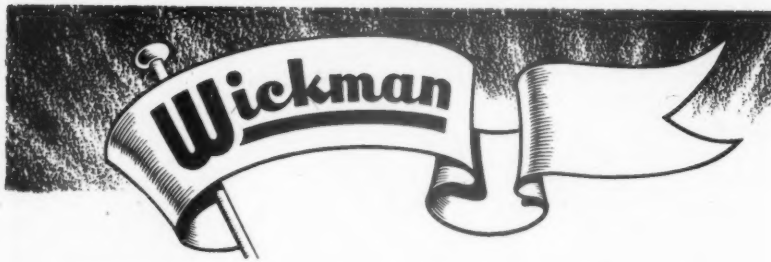

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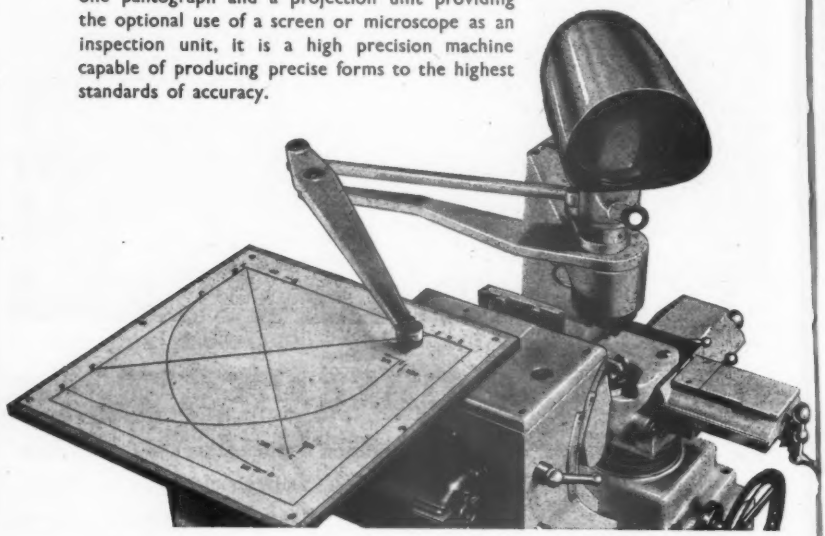

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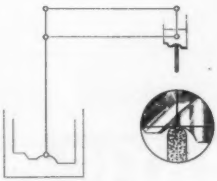

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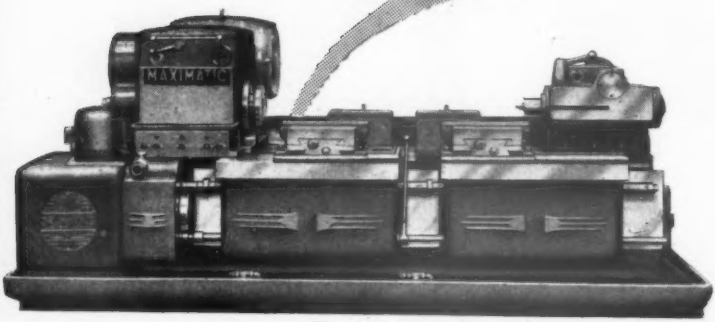

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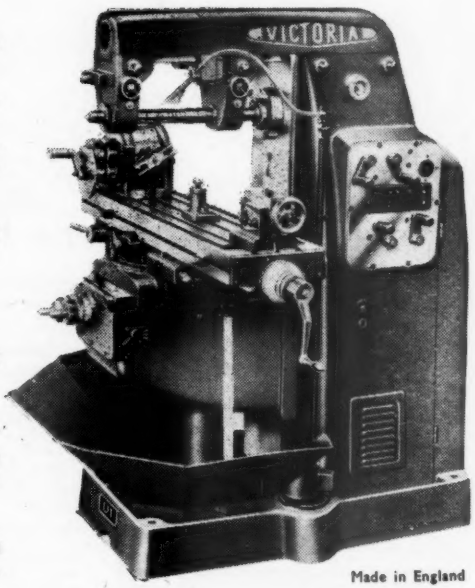

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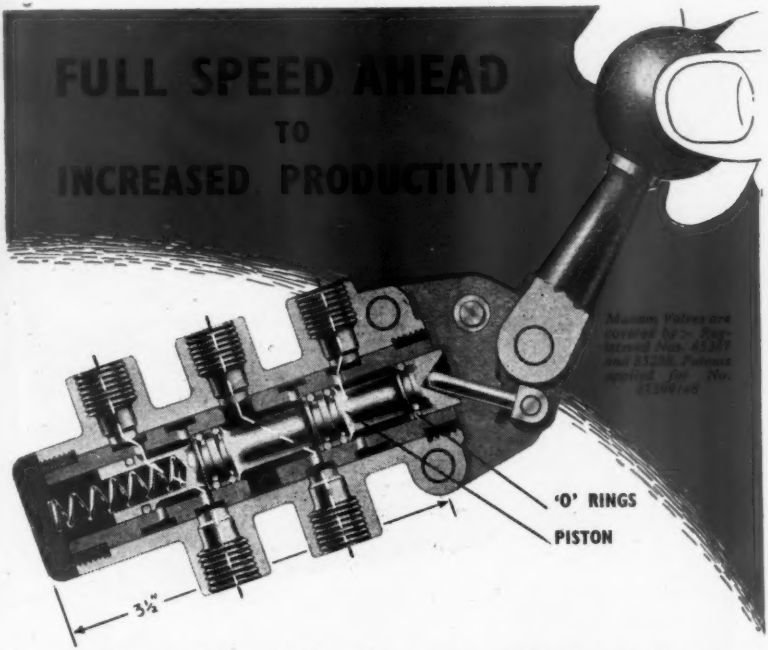

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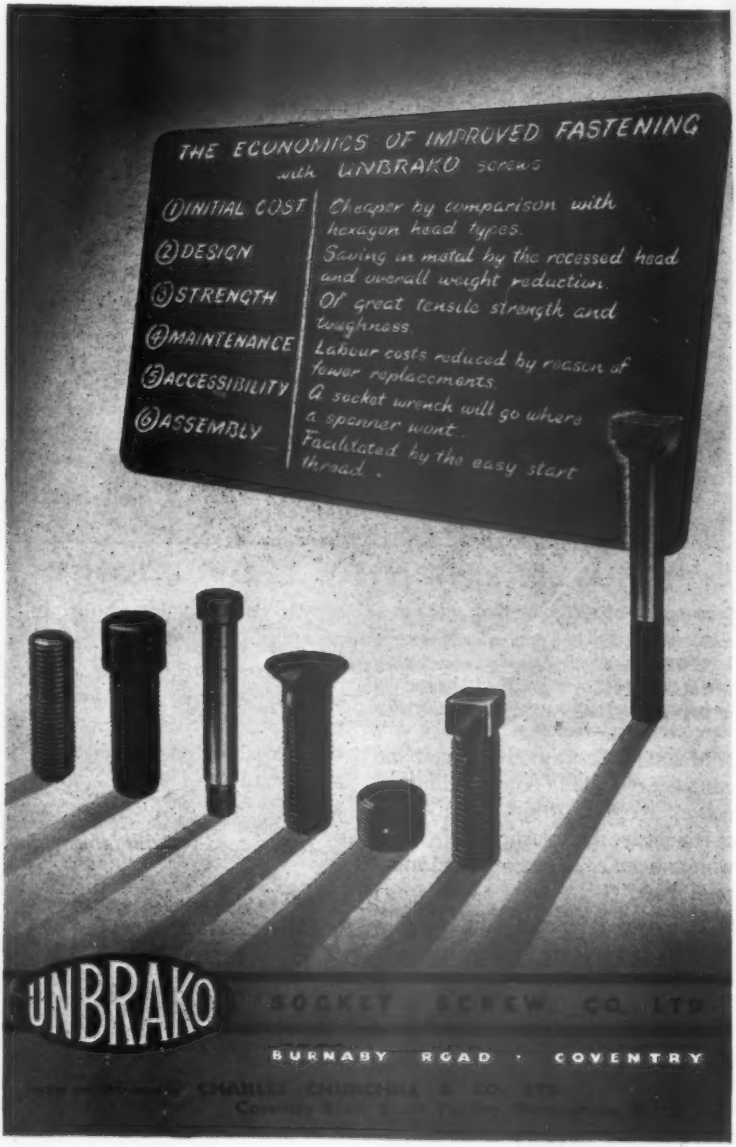
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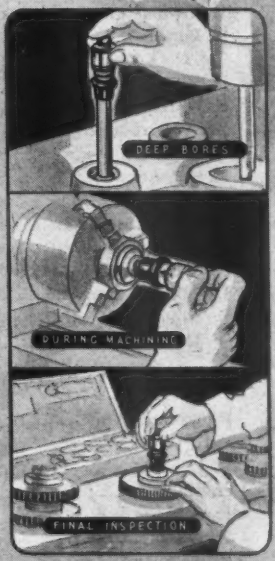

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THE Technical and Publications Committee came into being in 1941 as a result of the War Emergency Committee's belief that there existed in the Institution a great potential of valuable knowledge which could be utilised for the benefit of the nation at that time.

It was felt that the best way of obtaining and disseminating this knowledge was through the medium of a special Institution publication, which was in due course entitled " The Technical Bulletin ". Members were invited to contribute for publication articles and correspondence dealing with problems encountered in their own industries, which they felt would be of help to other engineers in obtaining vital wartime production.

In addition to producing the monthly " Bulletin ", the Committee was charged with answering members' technical enquiries, and with taking over the duties of the original Papers Committee, which consisted of selecting material for publication in the Journal, and making recommendations for Institution awards.

From the beginning it was clearly demonstrated that the new Committee fulfilled a distinct and much-needed service. During the first year of its life many hundreds of letters and enquiries were dealt with at the weekly meetings, and collaboration was invited by various Government departments, particularly the Ministry of Supply and the Ministry of Aircraft Production.

In 1943, owing to prevailing shortage of paper, it was found necessary to discontinue the Technical Bulletin, but the Committee's technical assistance continued to be in considerable demand throughout the war, and during the immediate post-war period.

The scope of the Committee's work has increased steadily, and now falls into four distinct sections :

1. The compilation and management of the monthly Journal.
2. Dealing with members' technical enquiries.
3. Maintaining press liaison and supplying material for publication.
4. Recommendations for Institution awards.

THE JOURNAL

It is the firm policy of the Committee to select for publication in the Journal only those papers which have been presented to Sections, and which in every way achieve the high standard of technical value essential to a professional Institution. It should be emphasised that the term " technical value " is not used in a purely mechanical sense ; the Committee

recognises that every profession has its own particular techniques, and many allied to production engineering come under this heading, e.g. accountancy and the study of industrial relations, to name only two.

Each paper received by the Committee is read by at least two members, and assessed by a carefully evolved method whereby marks are allotted for technical value, method of presentation and illustrations, readability, discussion and general interest. Broadly speaking, a paper must obtain a marking of 70% or over in order to be published in the Journal.

It will be seen that in order to receive the highest possible marking, a paper must be submitted complete with illustrations and discussion, and it is for this reason that the Committee constantly impresses this fact on those responsible for submitting papers. It is apparent that if a good paper is submitted without illustrations essential to the text, the manuscript is virtually useless and consequently receives a low marking.

The Committee is anxious to assist in every possible way in the preparation of papers, and accordingly the position as it concerns the Institution is set out in the pamphlet, " Notes for the Guidance of Authors ", with which Section Honorary Secretaries are supplied in order to assist them when approaching lecturers. The copyright of any original paper presented to a Section becomes the property of the Institution, unless other and prior arrangements satisfactory to both parties are made. This does not, however, prevent the reproduction in other forms of papers presented to Sections, provided only that the Institution is given due acknowledgment. Neither would the Institution unreasonably withhold permission to use the material elsewhere so long as the Institution's copyright is acknowledged.

In addition to papers of technical interest, the Journal contains reports of other activities in Sections and news items which the Committee considers will interest members. The Committee is always glad to receive news items from Sections, particularly those of interest to Graduate members, provided that such items are reasonably topical and not two or three months in arrear.

From time to time the Committee receives comments on the appearance and content of the Journal, and recently in order to obtain a consensus of opinion, each Section President and Chairman was invited to obtain the views of his Section regarding the Journal, under the headings of size, content, and presentation. This request has been well received, and when the response has been analysed, the Committee will give most careful consideration to the suggestions made.

PRESS LIAISON

Shortly after its formation, the Committee, recognising the value of suitable publicity for Institution affairs, established a policy of keeping the technical press informed on such matters, and a most happy relationship now exists not only with the technical press, but with industrial correspondents and the national press generally. There is a steady demand for copies of papers presented to Sections, and here the Committee depends very largely on the co-operation of Section Honorary Secretaries and lecturers to keep up the supply, and maintain the lively interest now shown in Institution affairs.

TECHNICAL ENQUIRIES

Many members, firms, professional associations and Government departments have sought the assistance of the Committee on technical problems during the past ten years. Enquiries are received not only from all over the United Kingdom, but also from the Commonwealth, and in the majority of cases it has been possible to give the help required. Usually this consists of putting the enquiry to a member with the appropriate experience. It must be understood, however, that under no circumstances will the Committee entertain enquiries which form part of any sort of dispute.

INSTITUTION AWARDS

In addition to selecting papers for publication in the Journal, the Committee recommends to Council each year the names of authors in connection with the award of Institution Medals for the best papers by a member and a non-member, and makes available to other Committees its assessment of papers as necessary.

Beyond the foregoing, the Committee has recently had under continuous review the conditions under which the Institution could adopt an entirely new policy in connection with Institution papers.

A proposal was outlined to Council in a memorandum presented in January, 1951, and was unanimously approved. The Committee was given authority to proceed with arrangements and an official announcement in this respect will be made by the President of the Institution in the near future.

MEMBERS OF THE COMMITTEE

The Committee now meets on alternate Wednesday evenings at Head Office, the present Chairman being Mr. A. L. Stuchbery, M.I.Mech.E., Chief Technical Engineer of The Metal Box Co. Mr. Stuchbery is a Member of Council and Past President of the London Section, and also serves on the Finance and General Purposes Committee, the Research Committee, and the London Section Committee.

Other members of the Committee are :—

Mr. E. D. Broome.	Works Director, Molins Machine Co., Ltd., London. Member of Council, of the Special Committee on Reorganisation, and of the London Section Committee.
Mr. R. M. Buckle.	Manager, Machine Maintenance Division, Vauxhall Motors, Luton. Member of Council; Hon. Secretary to the Luton Section.
Mr. J. W. Buckley.	Works Manager, George Kent Ltd., Luton. Past President, Luton Section, and serving member of the Section Committee.
Mr. L. Bunn.	Director and General Manager, Gay's (Hampton) Ltd., Middlesex.
Mr. H. A. Chambers.	General Manager, Rockwell Machine Tool Co., Wembley.
Mr. William Core.	London Director, Alfred Herbert Ltd. London Section President, 1949-51. Member of Council, and member of Finance and General Purposes Committee.
Mr. W. J. T. Dimmock.	Works Manager, Hoover Ltd., Perivale. Member of Research Committee and Materials Handling Sub-Committee.
Mr. A. A. J. Francis.	Jig and Tool Superintendent, A.E.C., Ltd., Southall, Middlesex.
Mr. H. Grigg.	Chief Planning Engineer, Arnott & Harrison, Ltd., London.
Mr. R. Hutcheson.	Editor, "Machine Shop Magazine." Hon. Secretary to the London Section. Member of Hazleton Memorial Library Committee.
Mr. T. R. Kidd.	Technical Director, Edgar Vaughan & Co., Ltd., Birmingham.
Mr. R. Kirchner, M.I.Mech.E.	Director & General Manager, Arnott & Harrison, Ltd., London. Mr. Kirchner has been a member of the Committee since its formation, and was Chairman from 1942-1944. Member of Council, President Elect, London Section.

Mr. F. P. Laurens, O.B.E., M.I.Mech.E.	Director and General Manager, Engineering Works and Shipyard, Vickers-Armstrongs, Ltd., Barrow-in-Furness. Past President of London Section.
Mr. R. E. Leakey.	Manager, Production Engineering Department, E.M.I., Ltd., Hayes, Middlesex. Chairman of the T. & P. Committee, 1946-48. Member of the London Section Committee.
Mr. A. McLeod, Mem. Iron & Steel Inst., M.I.W., M.I.M.	Managing Editor, Industrial Newspapers, Ltd. Chairman, T. & P. Committee, 1944-46.
Mr. T. Price.	Engineering Director, E.M.I., Ltd., Hayes, Middlesex.
Mr. A. Roberts.	Chief Planning Engineer, Cramic Engineering Co., Ltd., Southall, Middlesex.
Mr. B. W. M. Wakefield, M.B.E.	Chief Tool Designer and Development Engineer, Rotax Ltd. Willesden. Member of Standards Committee.

The Committee have a very able Secretary in Miss M. S. C. Bremner, Head of the Technical and Publications Department at Head Office, who has been Secretary of the T. & P. Committee since she joined the staff in 1945.

Miss Bremner first entered journalistic work in 1936, when she was secretary to the Editor of the Liverpool Evening Express. In 1937, she was promoted to sub-editor in the Features Department, and it is interesting to note that in 1939 the feature page of this paper was selected by the *World's Press News* as one of those outstanding in provincial journalism.

During the war Miss Bremner was in the Aeronautical Inspection Directorate of the Ministry of Aircraft Production. She held a number of appointments in the Directorate which enabled her to gain a useful technical background, which has been of considerable value to the Institution.

INSTITUTION NOTES

June, 1951

MACHINE TOOL ADVISORY PANELS

Members will have seen in the Press reference to the Ministry of Supply's announcement that Machine Tool Advisory Panels are being set up. The main objects of the Panels will be to advise the Ministry on the allocation and effective utilisation of machine tools.

The Panels will consist of representatives of the Machine Tool Trades Association and members of the Institution of Production Engineers, and they will be established on a regional basis. The Institution's nominations to the Panels will be made through Section Presidents and Sub-Section Chairmen.

Members of the Panels will be constituted as honorary consultants to the Minister, and their duties will be advisory only. Senior members who would be willing to join the Panels should communicate with their Section Presidents or Sub-Section Chairmen.

GRADUATE SECTION REPRESENTATIVES CONFERENCE, BIRMINGHAM, 31st MARCH, 1951

An event of considerable importance was the First National Graduate Section Representatives' Conference, which was held in Birmingham on 31st March last. The Conference was convened by the London Graduate Section, and delegations were present representing Graduate Sections throughout the country.

The business of the Conference was divided into two parts. During the morning session matters dealing with organisation of Graduate Sections were discussed, including steps to increase attendance at meetings, and ways and means of obtaining more papers by Graduates. The organisation of week-end schools and industrial tours was debated, and the morning session ended with a discussion on Graduate Sections' expenses. Throughout the session there was evidence of the very considerable amount of thought which had been put into recommendations made by various delegations, and some of these may in years to come have an important bearing not only on Graduate but also on Senior Section activities.

After lunch, questions of Institution policy affecting Graduates were discussed. These included the Institution Journal and Institution Awards. Mr. W. F. S. Woodford, the Institution's Secretary,

The Graduate Conference in session (left to right, outside table): W. E. Hipkiss, J. W. Smith, A. S. Sault, J. D. Gutteridge, S. R. Tyler (Wolverhampton Chairman), B. Hollington, R. T. Mustard (Joint Conference Secretary), A. G. Bradbury (Birmingham Acting Chairman), W. F. S. Woodford (Institution Secretary), H. Peter Jost (Conference President), W. Silberbach (Joint Conference Secretary), A. P. Oppenheimer (London Chairman), P. Spear, E. F. Constable, R. Broaderwick, E. F. Key (Coventry Chairman), C. J. Emery, D. W. Wood. (inside table): K. Lawrence, E. A. Hewitt, G. Smith, N. K. Barooah, F. W. Walton (Liverpool Chairman), G. H. Armes, H. Bradshaw (Manchester Chairman), R. Cleary.

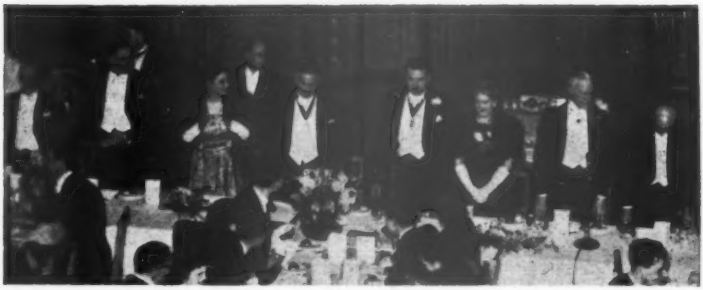
who was a guest of the Conference, reported on the progress of the Institution and its relation with other senior Institutions. He was questioned on many problems. On the question of the Associate Membership Examination, the unanimous feeling of the Conference was that it should be maintained to the highest standards. Throughout the afternoon the desire of the delegates to assist to the utmost the Institution's efforts to establish the profession, and to stress the professional aspects of Production Engineering was repeatedly voiced. The frank exchange of the views of Graduate Section Committees, the high level of the arguments advanced and the practical value of the majority of recommendations made at the Conference, all contributed to its success.

The Conference was presided over by Mr. H. Peter Jost of the London Graduate Section and the arrangements for the meeting were made by Mr. R. T. Mustard, Hon. Secretary of the London Graduate Section, and Mr. W. Silberbach, Hon. Secretary of the Birmingham Graduate Section.

BIRMINGHAM SECTION DINNER DANCE More than 400 members and visitors made up the large and representative gathering at the Annual Dinner Dance of the Birmingham Section of the Institution

of Production Engineers, which took place at the Grand Hotel, Birmingham, on Saturday evening, 31st March last.

Mr. Harold Burke, M.I.Mech.E., F.I.I.A., the Birmingham Section President, occupied the Chair, and among those present were the Lord Mayor and Lady Mayoress of Birmingham (Alderman A. Paddon Smith and Mrs. Donald Paddon Smith), Major-General K. C. Appleyard, C.B.E. (National President), Sir Raymond Priestley (Pro-Chancellor of the University of Birmingham), Professor Marvin E. Mundel, Ph.D. (Professor of Industrial Engineering, Purdue University, Lafayette, Indiana, U.S.A.), and Mr. W. F. S. Woodford (Secretary of the Institution) with Mrs. Woodford.



Above, reading from left to right, are some of those who were on the top table : E. P. Edwards, Chairman of the Membership Committee ; Lt.-Col. D. Paddon Smith ; the Lady Mayoress of Birmingham ; the Lord Mayor of Birmingham, Ald. A. Paddon Smith ; H. Burke, President of the Birmingham Section and Vice-Chairman of Council ; Mrs. Burke ; Maj.-Gen. K. C. Appleyard, President of the Institution ; Sir Raymond Priestley, Principal and Vice-Chancellor, Birmingham University.

The Director of Ceremonies was Mr. E. Percy Edwards, the Dancing Compère was Mr. J. Silver, and incidental music and dance selections were played by Maurice Udloff and his Orchestra.

During the evening the Lady Mayoress, on behalf of the Institution, presented an electric table lamp of unusual design to Mr. and Mrs. Burke.

In proposing the toast of "The Institution of Production Engineers," the Lord Mayor said he had spent all his business life in a very large industrial establishment which was overrun by production engineers ! He would like to say that the industrial establishment was a very prosperous one. It had been built up entirely by private enterprise and its success was due very largely to the very excellent body, on the whole, of production engineers

engaged in the various factories. It was not entirely due to their efforts. They did not ascribe all the company's success to the activities of production engineers, but they were a very worthy body of men.

Referring to the shortage of raw materials, including particularly non-ferrous metals, the Lord Mayor said that Birmingham's industries were already complaining about that. One could not avoid feeling that this shortage was going to grow. Such materials as there were would, of course, be required in connection with the rearmament programme, but he did not propose to enter into that aspect of things.

He had noted that the Institution had a membership of 8,600, although only established in 1921, which was very good going. He was glad to note, also, the Schofield Travel Scholarship scheme for sending students from this country to America, started in 1950 when the Institution sent two Graduate members to the United States for six months. This year the Institution proposed to repeat that experiment and, in addition, was making arrangements to receive into British industry a number of students from European and Commonwealth countries. In order that the scheme should be promoted on a national basis, a Scholarship Fund had been set up.

It was interesting to notice that the Birmingham Section was the second largest in the country, so that it kept in step with the city which was the second largest in Britain. He understood that there were 850 members in Birmingham, of whom 250 belonged to a very active Graduate Section, and he wished the Institution the best of luck in these activities.

Major-General Appleyard, President of the Institution, responding, said that the energy and enterprise shown in every direction was particularly characteristic of the Institution, and they had evidence of that in the present very large gathering. Many things and many lives had gone to building up the Institution and handing it on to people who, in their turn, would add their contribution towards its growth and success. It was a living and growing thing, the Institution. It was gaining steadily in prestige and importance at a time when the nation needed it more than it had ever done before in our time. It was a great joy to those who were responsible for its administration to see that growth, and to see the young Graduates coming in and doing their work successfully.

Mr. Harold Burke, Birmingham Section President, in proposing the toast of " The Visitors," coupled with it the name of Professor Mundel who was paying a six months' visit to the United Kingdom, and had already spent two months studying the methods of industrial engineering and giving a series of lectures in connection with the Institution. Birmingham was particularly honoured as Professor Mundel had agreed to give a paper to the Section.

The Section were also delighted to have with them as guests the Lord Mayor and Lady Mayoress, Sir Raymond Priestley, and other distinguished visitors.

Professor Mundel, in reply, said it was extremely interesting to see this powerful organisation of Production Engineers. It was particularly heartening to realise that Production Engineers had such a large business body. As visitors, they appreciated to the full the friendly spirit which they had encountered on every hand.

FILM STRIPS ON PRODUCTION ENGINEERING

The Institution and Messrs. Stripslides Ltd., are collaborating in the production of Film Strips on aspects of Production Engineering, and the Education Officer is acting as Editor. These Strips, with suggested Teaching Notes, are being produced specifically for use in Teaching Establishments and Training Departments, and are distributed by Messrs. Dance-Kaufmann Ltd., 18 Upper Stanhope Street, Liverpool. The first strip entitled "ROUGH FORGING TO FINISHED PART" is now ready. This strip shows how an engineering component of fairly complex geometric form is produced on a quantity basis through a sequence of twenty-one operations. It may be used to illustrate a number of important aspects of Production Engineering such as :—

1. Accuracy and economic production by a breakdown of operations into a sequence of operations related through carefully chosen references and locations.
2. The specification of manufacturing procedure through simple but complete operation sheets. (A specimen sheet is shown.)
3. The actual manufacturing sequence leading to the production of a part of high accuracy from a forging.

A copy of this strip is available for inspection in the Hazleton Memorial Library.

THE COLLEGE OF AERONAUTICS The Governors of the College of Aeronautics, Cranfield, Bedfordshire, announce the appointment of Air Marshal Sir Victor Goddard, K.C.B., C.B.E., M.A., to succeed E. F. Relf, Esq., C.B.E., A.R.C.S., F.R.Ae.S., F.R.S., as Principal of the College. Air Marshal Sir Victor Goddard will commence his duties on 1st September, 1951.

LEICESTER SECTION DINNER

The Leicester Section of the Institution held their annual dinner on 18th April, 1951, at Leicester. Amongst those at the top table are Mr. H. L. Satchell, Director and Manager of B.T.H. Rugby Works, and President of the Leicester Engineering and Allied Employers Association; Mr. N. A. Cullin, Section President; Dr. Herbert Schofield, C.B.E., Past President of the Institution; and Major-General W. F. Hasted, President of Loughborough College. The guests also included seven Past Presidents of the Section.

NEWS OF MEMBERS

Mr. C. E. Bache, Associate, is now General Works Manager of Remington Rand, Ltd., Hillington Plant, Glasgow.

Mr. N. H. Bradbury, Associate Member, has been appointed Lecturer in Mechanical Engineering at Barnsley Mining and Technical College.

Mr. P. H. W. Everitt, Associate Member, is now Works Manager of Asea Electric, Ltd., London.

Mr. W. F. Fisher, Associate Member, has been appointed General Manager of Herbert Alexander & Co., Ltd., Leeds.

Mr. P. E. Goodwin, Associate Member, has joined the engineering staff of the Manufacturing Division of the Canadian Pratt & Whitney Aircraft Co., Montreal.

Mr. J. S. Hopkinson, Associate Member, is now Assistant Works Manager of The Anglo Celtic Watch Co., Ltd., Ystradgynlais, S. Wales.

Mr. G. Jenkins, Associate Member, has been appointed General Factory Manager of Phelon & Moore, Ltd., Cleckheaton.

Mr. R. G. Jones, Associate Member, is now Assistant Works Manager of the Orange factory of Electricity Meter Manufacturing Co. Pty. Ltd., New South Wales.

Mr. Luby

Mr. C. J. Luby, Member, has now taken up his duties as General Manager and Director of Canadian Steel Improvement, Ltd., Toronto. Mr. Luby, who was Works Manager of the Experimental Department of the Bristol Aeroplane Company, was an active member of the Western Section Committee.

Mr. F. Mountifield, Associate Member, is now Manager of the Business Office and Calculating Machinery Division of Elliott Bros. (London), Ltd.

Mr. H. F. Spinks, Member, has been appointed Machine Tool Efficiency Engineer with Short Brothers & Harland, Belfast. For several years Mr. Spinks took an active part in the affairs of the Institution as a member of the Birmingham Section Committee.

Mr. H. Stephens, Member, is now Production Engineer with H. M. Hobson, Ltd., Fordhouses, Wolverhampton.

Mr. G. A. Symons, Associate Member, has been appointed Production Engineer with the Irving Airchute Co. Inc., of Buffalo, New York.

Mr. A. F. Toe, Associate Member, is now Plant Engineer to Brillo Manufacturing Co. of Great Britain, Ltd., London.

Mr. L. P. Wilson, Associate Member, has been promoted from Assistant Works Manager to Works Manager of the Accrington, Lancs., factory of J. H. Fenner Co., Ltd.

Major E. A. Wimberley, O.B.E., Member, is now Chief Engineer to A. Brooke-Roberts & Co. Ltd., London.

Mr. J. Woolhouse, Intermediate Associate Member, has been seconded from British Insulated Callender's Construction Co. Ltd., to the Crown Agents for the Colonies, as Chief Assistant Engineer on the Cyprus Central Electrification Scheme.

Mr. J. Barr, Graduate, is now Assistant Production Manager of the Marine Pipe and Structural Feeding Departments of Mechans, Ltd., Glasgow.

Mr. G. C. Clarke, Graduate, is leaving the United Kingdom next month to take up a position as Production Engineer with Canadian General Electric, Montreal.

Mr. A. J. Ellis, Graduate, is now a Technical Assistant in the Experimental Department of Bryce Fuel Injection, Ltd., Staines.

Mr. Alan E. Fisher, Graduate, is now Planning and Estimating Engineer with Star Engines, Ltd., Coventry.

Mr. J. S. Manku, Graduate, is now Civilian Workshop Officer, E.M.E., Station Workshops, E.M.E., Jubbulpore.

Mr. M. C. Pobjoy, Graduate, has been appointed Lecturer in Mechanical Engineering at the Technical College, Bulawayo, Southern Rhodesia.

Mr. Kenneth Teale, Graduate, is now Senior Machine Tool Design Engineer with Short Brothers & Harland, Ltd., Belfast.

VISITOR FROM ABROAD

Mr. Charles Pullen, Member, Hon. Secretary of the Australian Sub-Council and of the Melbourne Section, is at present visiting the U.K. on behalf of the Government Aircraft Factories, Melbourne, in connection with the production of the " Canberra " bomber.

Mr. Pullen went to Australia in 1942, at the request of the Commonwealth Government, to take up the position of Assistant Manager and Chief Engineer at a new aircraft turret factory in Victoria, and was later transferred to the Government Aircraft Factory at Fishermen's Bend, Melbourne, where he is now Chief Draughtsman.

A founder member of the Melbourne Section in 1942, Mr. Pullen has taken a leading part in the development of the Institution's activities in Australia. He arrived in London last month, and expects to remain in the U.K. for three or four months. His address is c/o Dept. of Supply—Aircraft Production, " Canberra House," 87, Jermyn Street, London.

Mr. Pullen

OVERSEAS VISITORS A cordial invitation is extended to all members from overseas Sections who visit the United Kingdom to call at Head Office, where the Secretary and staff will be pleased to meet them, and to provide all possible assistance.

All members who intend visiting countries in which the Institution is represented are invited to write to the Secretary for letters of introduction, with a view to strengthening the ties between overseas Sections and the United Kingdom.

LIBRARY ABSTRACTS

The following abstracts relate to books recently acquired by the Library. These may be borrowed on application to the Librarian, and it would be helpful if the classification number could be quoted in every case.

658. INDUSTRIAL ORGANISATION, MANAGEMENT

"The Nature of Management" by H. R. Light. *Sir Isaac Pitman & Sons, Ltd., London. 159 pages.*

This book has been written as a leader to those who intend to search further into the science of management. The author presents the problems of industrial management in such a manner as to urge deeper and more serious study. The book is not intended to answer management problems, although it explains what management is about, its application and use.

660. CHEMICAL ENGINEERING

"Chemical Engineering Operations" by Dr. F. Rumford. *Constable & Co., Ltd., London. 376 pages.*

This work serves as an introduction to the various apparatus generally associated with chemical and processing plants. A comprehensive review is made of the various types of proprietary plant, i.e. heat exchanges, stills, evaporators, dryers, mixers, filters, screens, separators, etc. It is essentially practical rather than academic, although sufficient examples are fully worked out of capacities, etc., to enable any engineer to ascertain broadly at least what requirements are needed to meet any normal application.

531.7 METROLOGY

"Engineering Metrology" by K. J. Hume, B.Sc., A.M.I.Mech.E., M.I.Prod.E. *Macdonald & Co. (Publishers), Ltd., London. 293 pages.*

This review of engineering measurement and inspection, although basically a textbook for the advanced student, contains also frequent references to the practical aspect of the subject. The basic principles of mathematics, mechanics and optics involved in metrology are dealt with first, followed by sections on standards of measurement, limits and limit gauging, gauge manufacture and workshop processes. The subsequent sections cover all the measuring and inspection methods and instruments normally encountered in engineering production, such as linear and angular measurements, dividing, straightness, flatness and squareness testing, alignment testing and screw thread measurement. Individual chapters are further devoted to the subjects of surface finish and its measurement, gauge and instrument design and miscellaneous measurements such as gear measurement and hardness testing. A classified bibliography is appended.

664.6 BAKERY

"Modern Management for Bakers and Confectioners" by E. V. Amsdon and H. E. Turner. *Trade Technical Services, London, 1951. 79 pages.*

This handbook briefly illustrates how many of the accepted principles of modern management may be applied by those engaged in the bakery and

confectionery trades. Special emphasis is laid on the need for reducing production costs. Two examples of a bonus scheme suitable for the trade are included under the chapter headed " Management of Labour," and a glossary of Bakery Costing Terminology is appended.

HAZLETON MEMORIAL LIBRARY. RECENT ADDITIONS.

331.2 WAGES ; PAY

Office Management Association, London. **" Clerical Salaries Analysis, 1950, [with] (Clerical Job Grading Schedule)."** *Lond., The Association.* 1950. *85 pages.*

331.82 WORKING CONDITIONS

Cohen, B. J., and Towy-Evans, M. M. **" Working Conditions and Employee Services."** (2nd Rev. Ed.) *Lond., Institute of Personnel Management.* 1950. *88 pages.*

338.9 PRODUCTIVITY

Rostas, L. **" Comparative Productivity in British and American Industry."** *Cambridge, University Press.* 1948. *263 pages.* (National Institute of Economic and Social Research—Occasional Papers XIII).

Tippett, L. H. C., and others. **" Indices of Productivity."** *Lond., B.I.M.* 1949. *36 pages.* (Conference Series 9.).

519.2 STATISTICS ; THEORY OF PROBABILITY

Wharton, A.S. **" Quality Through Statistics."** (2nd Ed.) *Lond., Philips Electrical Ltd.* 1945. *62 pages. Charts.*

536.5 TEMPERATURE MEASUREMENT AND CONTROL

Griffiths, Ezer. **" Methods of Measuring Temperature."** (3rd Ed. Rev.) *Lond., Griffin.* 1947. *223 pages.* Illustrated. Diagrams.

Griffiths, Roosevelt. **" Thermostats and Temperature Regulating Instruments."** (3rd Ed.) *Lond., Griffin.* 1951. 217 *pages. Illustrated. Diagrams.*

621.313 ELECTRIC MACHINES

Bottle, E. K. **" Fractional Horse-Power Motors : A Guide to Types and Applications."** *Lond., Griffin.* 1948. *209 pages. Diagrams.*

621.3655 INDUCTION HEATING

Curtis, Frank W. **" High-frequency Induction Heating."** (2nd Ed.) *New York, McGraw-Hill.* 1950. *389 pages. Illustrated. Diagrams.*

621.38 ELECTRONICS

Markus, John, and Zeluff, Vin, *eds.* **" Electronics for Engineers."** Articles, Charts and Graphs from *Electronics* Magazine. *New York, McGraw-Hill.* 1945. *390 pages.*

621.7 WORKSHOP PRACTICE

Wilson, Frank W., *ed.* **" Tool Engineers' Handbook."** American Society of Tool Engineers, F. W. Wilson, editor-in-chief. *Lond., McGraw-Hill.* 1951. *2,070 pages. Illustrated. Diagrams.*

621.791 WELDING

Crawford, E. **" Questions and Answers on Electric Arc Welding."** *Lond., Newnes.* 1949. *112 pages. Illustrated. Diagrams.*

Riddihough, M. **" Hardfacing by Welding."** *Lond., published for " Welding " by Louis Cassier Co. ; distributed by Iliffe.* 1949. *127 pages. Illustrated. Diagrams.*

621.793 METAL COATING

Ballard, W. E. **" Metal Spraying and Sprayed Metal."** Rewritten by W. E. Ballard. (3rd Ed.) Based on previous eds. by E. C. Rollason, T. H. Turner and N. F. Budgen. *Lond., Griffin.* 1949. *362 pages. Illustrated. Diagrams.*

Gailer, J. W., and Vaughan, E. J. **" Protective Coatings for Metals."** *Lond., Griffin.* 1950. *261 pages.*

621.83 GEARS

Buckingham, Earle. **"Manual of Gear Design."** *New York, Machinery.* 1935–7. 3 Vols.

621.86 MATERIALS HANDLING

American Standards Association. **"Safety Code for Conveyors, Cableways and Related Equipment, 1947."** *New York, A.S.M.E.* 1947. *53 pages. Diagrams.* (A.S.A. B.20.1–1947.).

Australia—Department of Post-War Reconstruction—Division of Industrial Development. **"Materials Handling."** *Melbourne, The Division.* 1945–7. *4 parts. Illustrated. Diagrams.*

621.89 LUBRICATION

Wakefield, C. C. & Company, Ltd., London. **"Road Vehicle Lubrication."** (Rev. Ed.) *Lond., The Company.* 1951. *54 pages. Illustrated. Diagrams.*

621.9 MACHINE TOOLS

Parkinson, A. C. and Dawney, W. H. **"Thread Grinding and Measurement."** *Lond., Pitman.* 1949. *227 pages. Illustrated. Diagrams.*

Schlarman, H. **"Manual of Die-Head Thread Cutting."** *New York, McGraw-Hill.* 1949. *266 pages. Illustrated. Diagrams.*

658.5 PRODUCTION PLANNING AND CONTROL

Buckingham, Earle. **"Principles of Interchangeable Manufacturing."** (2nd Ed.) *New York, Industrial Press.* 1941. *258 pages. Illustrated. Diagrams.*

Colvin, Fred. H. **"Starting a Small Machine Shop."** *New York. McGraw-Hill.* 1948. *212 pages. Illustrated. Diagrams.*

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658.54 TIME AND MOTION STUDY

Carroll, Phil. **"Time Study for Cost Control."** (2nd Ed.) *New York, McGraw-Hill.* 1943. *301 pages. Illustrated. Diagrams.*

660. INDUSTRIAL CHEMISTRY

Frier, W. T. and Holler, Albert C. **"Introduction to Industrial Chemistry."** *New York, McGraw-Hill.* 1945. *368 pages. Illustrated. Diagrams.*

661.2 SULPHUR

Great Britain—*Technical Information and Documents Unit.* **"Methods of Sulphur Recovery in Germany and Some Related Points concerning the Problem of Sulphur Shortage in the United Kingdom."** [With] (Supplement). *Lond., T.I.D.U.* 1951. *8 pages. 7 pages.*

667.6 PAINTS

Heaton, Noel. **"Outlines of Paint Technology."** (3rd Ed. Rev.) *Lond., Griffin.* 1948. *448 pages. Illustrated. Diagrams.*

669. METALLURGY

Greaves, Richard Henry and Wrighton, Harold. **"Practical Microscopical Metallography."** (3rd Ed.) *Lond., Chapman & Hall.* 1950. *272 pages. Illustrated. Diagrams.*

669.71 ALUMINIUM

Northern Aluminium Company Limited, London. **"Extraction and Fabrication of Aluminium."** *Lond., The Company.* 1949. *113 pages. Illustrated. Diagrams.*

681.4 OPTICAL INSTRUMENTS

Deve, Charles. **"Optical Workshop Principles,"** trans. of **"Le Travail des verres d'optique de precision,"** translated by T. L. Tippell. *Lond., Hilger.* 1945. *306 pages. Illustrated. Diagrams.*

808.5 PUBLIC SPEAKING

Crawford, Archibald. **"Mind Training for Speech-Making."** *Lond., Pitman.* 1947. *136 pages.*

THE LIBRARY The Library will be open between 10 a.m. and 5.30 p.m. on Mondays, Tuesdays, Thursdays and Fridays; between 10 a.m. and 8 p.m. on Wednesdays; and between 10 a.m. and 1 p.m. on the first Saturday of every month.

JOURNAL BINDERS Members are reminded that binding cases for the Journal are obtainable from Head Office, price 7/6 each post free. The cases, each of which will hold 12 issues of the Journal, are made of stiff board covered with imitation leather cloth, with gilt lettering on the spine.

CHANGE OF ADDRESS It would be of great assistance to Head Office if members would ensure that the business addresses contained in their records were up-to-date, and would notify Head Office as soon as possible of any change of appointment.

RESEARCH PUBLICATIONS A number of copies of the following Research publications are still available to members, at the prices stated :

Report on Surface Finish, by Dr. G. Schlesinger	15/6
Machine Tool Research & Development	10/6
Practical Drilling Tests	21/-
Test Charts for Machine Tools, Parts 3 and 4	5/6 each

These publications may be obtained from the Production Engineering Research Association, "Staveley Lodge", Melton Mowbray, Leics.

ISSUE OF JOURNAL Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

IMPORTANT In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

WORK MEASUREMENT RESEARCH UNIT

National Survey of Time Study Practice, 1950

GENERAL ARRANGEMENTS The first nation-wide survey of Time Study Practice carried out by the Work Measurement Research Unit of the University of Birmingham was completed in November last year. This survey was planned and organised in close collaboration with the Joint Committee on Measurement of Productivity set up by the Institution of Production Engineers and the Institute of Cost and Works Accountants.

Including a preliminary meeting in Birmingham, there were 17 meetings in 12 different centres. During each meeting films were shown depicting industrial and laboratory operations. Each engineer computed his normal times for all the operations studied and compared them with provisional values established by a control group of time study engineers. Opportunity was provided for discussion both of the procedure and of the quality of individual studies.

The total attendance was about 750 and 722 rating forms were completed by engineers from 286 firms. However, 80 of the participants had no previous experience of time study, and 16 forms have been rejected as "spoiled." These 96 forms are not being used immediately, leaving 626 available for detailed analysis.

DISTRIBUTION OF PARTICIPANTS The distribution of the participants by industry was as follows :

The more basic manufacturing industries	12%
Precision and other manufacturing	16%
Non-metallic manufacturing	10%
Manufacture of rubber	13%
Manufacture of chemicals, glass, etc....	12%
Electrical manufacturing	18%
Textile industries	17%
Others (teachers, consultants, etc.)	2%

It would be misleading to assume that the number of participants is in any way an indication of the relative extent to which time study is used in the respective industrial groupings. This is especially the case with the rubber industry, which adopted the policy of sending a large proportion of their time study engineers to the survey meetings.

RATING SCALES USED Engineers were asked to record the rating values for both normal performance and standard (or incentive) performance, as for example 60/80, the first figure being the normal and the second the standard value. Where only one value was used as a datum, this was given separately, as for example, —/80 or 100/—. Although 75% of the engineers used a rating scale based on a normal performance rating of 60, there was a total of 37 different rating scales quoted. These fit readily into the 10 categories used for coding the data, as shown in the table below :—

Code Number	*Rating Scale*	*Percentage of Engineers using scale*	
0	60/80	57	
1	60/75	5	75
2	60/—	13	
3	100/125	2	
4	100/133	8	17
5	100/—	7	
6	75/100	2	
7	80/100	3	6
8	—/100	1	
9	—/80	2	2

ANALYSIS PROCEDURE The full analysis of the survey, to ascertain the quality of time study rating, is being carried out. The results and interpretation of the calculations will not be available until later this year, when it is hoped to publish a further report.

FURTHER RESEARCH WORK In addition to the analysis of the 1950 survey results, the Research Unit is now engaged on the analysis of a comprehensive series of studies taken on the shop floor in the works of a number of co-operating firms. This new series has been designed to provide additional data which will be used to estimate the effect of a number of the variables occurring in time study practice, additional to those which can be assessed from the national survey results.

A considerable number of operators, time study engineers (all of whom have already taken part in the national survey) and industrial executives are assisting the Research Unit in this new phase of the research project.

"BUILDING AN OCEAN LINER"

by J. S. REDSHAW O.B.E., M.I.N.A.

(Report of a meeting of the London Section of the Institution, 15th February, 1951)

INTEREST in " the other fellow's job " was shown to a high degree when Mr. J. S. Redshaw, who is Chief Naval Architect at Vickers-Armstrongs Ltd., Barrow-in-Furness, delivered his paper " Building an Ocean Liner " to the London Section of the Institution on February 15th, 1951. Mr. Redshaw spoke for 70 minutes, and the discussion which followed could have been prolonged for an equal length of time had this been available. Mr. Redshaw brought with him 60 lantern slides for illustration purposes, but was unable to show all of them in the time available to him.

A REVOLUTIONARY CHANGE

Opening his address, Mr. Redshaw mentioned Britain's long standing supremacy as a seafaring country, and said that the change from wood to metal construction of ships' hulls had a revolutionary effect upon the maximum length of ships. In wooden construction, the short lengths of material available to make up a curved structure could be only imperfectly connected and a length of 200 ft. or thereabouts was seldom exceeded if ships were to be sufficiently strong.

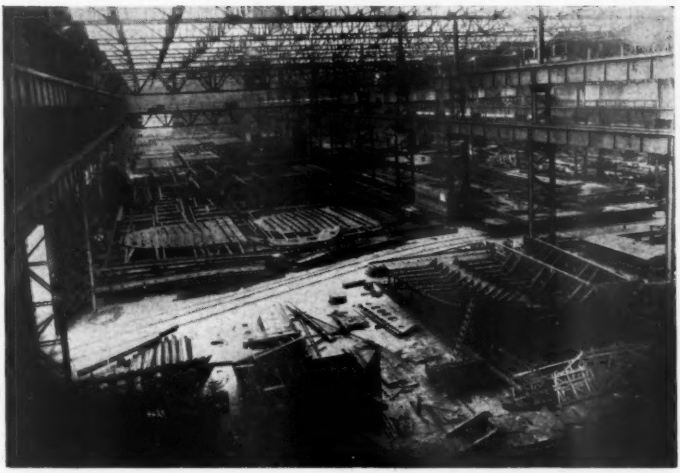
With the advent of the iron hull, the ability to join plates with a joint strength only slightly inferior to that of the parent metal removed the embargo on size. At the same time, the marine steam engine was developed, bringing to a close the phase of dependence upon the wind for propulsion. Thus, ship construction moved wholly into the realms of the engineer.

Next, Mr. Redshaw surveyed the initial steps which lead up to the building of a ship. The design is made to a specification laid down by the customer and this includes guarantees of speed, fuel consumption, and specifications to meet the requirements of climatic conditions.

The lines of a ship are not evolved to satisfy the artistic fancy of the architect but are derived from factors such as design economics, propelling power of the machinery and the conditions to be met in the customer's specification. Empirical experiments with wax models in testing tanks are used to define the final lines of the hull.

When the final hull shape has been decided upon the lines are laid out full size in chalk upon the black floor of a mould loft, where the curves are smoothed or faired. The faired lines are detailed in the form of offset measurements and passed back to the drawing office, where detail design is started and continues throughout the construction of the ship.

In wooden ship construction the frame timbers or ribs constituted



1. Interior of Welding and Assembly Shop, Vickers-Armstrongs, Barrow.

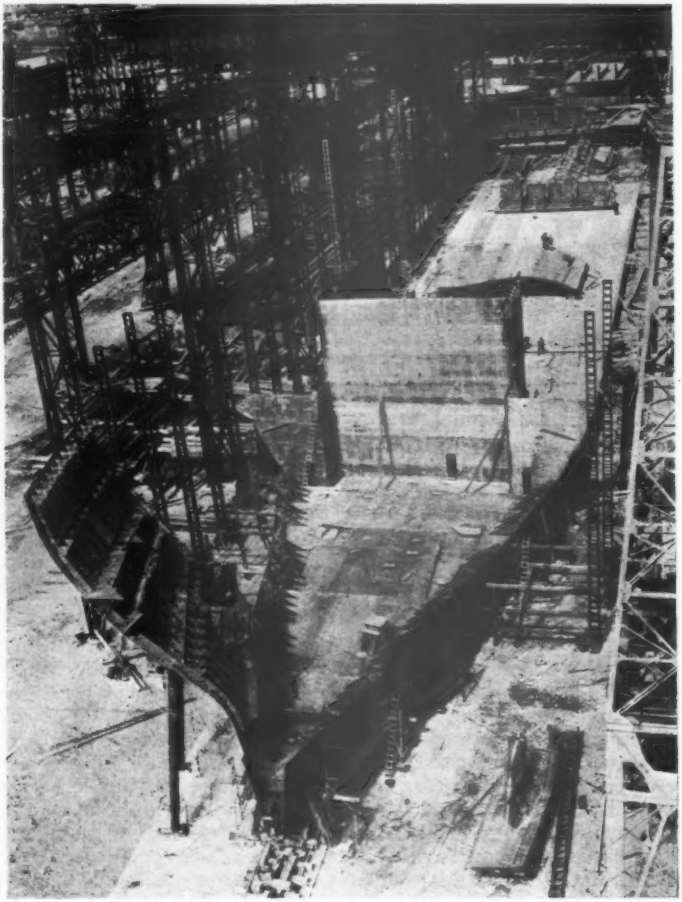
the primary strength members. In a metal ship the skin or plating forms the primary strength member and the frame members and deck beams fulfil the secondary duty of stiffeners and supports. The transverse bulk heads were introduced with metal ship construction and form watertight compartments, giving protection against damage, and serving the purpose of stiffeners for the ship structure. They are a valuable development in the structure of ships.

INCREASED USE OF WELDING

Mr. Redshaw emphasised the change in ship construction methods which had arisen during the last ten years, due to the increased use of welding whereby large components or sections of a ship structure can be pre-fabricated. Riveting is still retained for certain parts of the structure, but its use is being reduced constantly as new applications for welding are evolved. The welded joint has many advantages in ship construction. It is superior to riveting in strength, and by the elimination of overlaps on plates its use effects substantial savings in material. Each rivet in a riveted ship is a potential leak when the structure is overstrained, while the welded joint remains watertight under severe stress.

Although the pre-fabrication of components for ship structures was recognised early as a means of cheapening and speeding

production, the use of riveted plates as a construction method, with need for overlapped and staggered joints, made the knitting together of large sections a geometric impossibility. Welding eliminated the staggering of joints and it became feasible to join together



2. Stern end of a large single-screw vessel showing a section of side shell and framing erected as a unit.

large sections. One of the penalties of resorting to large prefabricated sections is that cranes of approximately 40 tons capacity are required to handle them at the building berth. Formerly, small cranes and derricks were adequate for lifting single plates and ribs into position. The size and weight of sub-assemblies is controlled by the crane capacity available.

Mass production of ships of uniform design, a wartime necessity, is not practised. Now, a wide diversity of types of ships is the aim and this work has required a virtual rebuilding of the shipyard without causing serious interruption of building programmes. This change in organisation has brought into being huge welding shops of over 1,000 ft. in length, with clear bays up to 90 ft. in width, and 40 ft. high, in which complete bulkheads and deck sections may be fabricated.

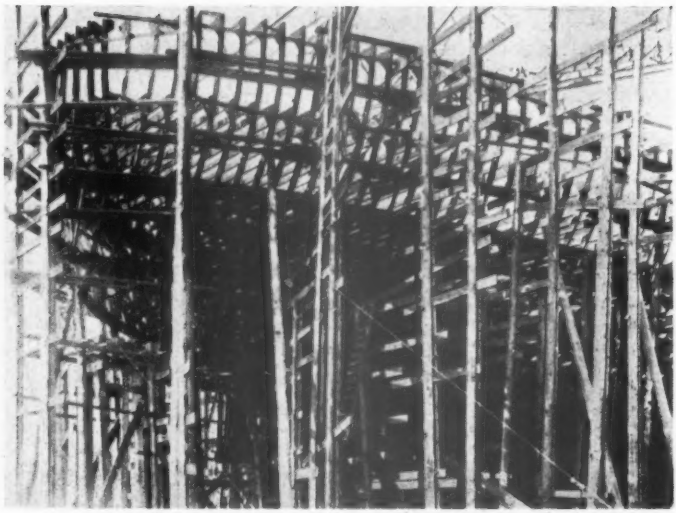
Large flame-cutting tables have displaced the shearing machines and plate edge planers required for riveted construction. Flame-cutting to shape and edge bevelling of plates now takes place simultaneously. Plates are assembled by high speed machine welding wherever possible. A feature of the welding shops is the uninterrupted space for handling and turning over large sub-assemblies.

In the building berth, the lower components rise from the double bottom, which is a raft-like structure laid on building blocks. Accurate positioning of parts is important in the early stages, as any errors are liable to be accumulative in effect. At the head of the berth is a large board giving the exact gradient of the building berth for the information of the erectors. Building on a slope, down which the ship is launched, adds complication to the work.

Plating panels complete with welded-on frames and side girders forming units of 26 tons or more in weight are lifted into place. This is in direct contrast to the old method of erecting a skeleton first and then covering this with plates. A snug fit between mating parts is essential in welded ship construction in order to obtain sound joints and to obtain a smooth appearance.

USE OF FABRICATED PARTS

Substitution of fabricated parts for steel castings has resulted in efficiency and cost reduction. Bracket arms and barrel arms for supporting the propellor shafts are now fabricated, together with extremities for both the stem and stern of the ship. Graceful curvature and smooth finish are not sacrificed when welded parts are used, and propulsive efficiency is retained. Direct welding of pipes, seatings and brackets to the structure eliminate much bolting and riveting. Attachment of the wood deck sheathing by means of automatically welded-on studs has proved successful and has displaced the old-style tapped-in bolt which was a source of leakage.



3. Stern end of a liner on the building berth showing the piece-meal system of erection with riveted construction.

4. A pair of large propeller brackets being moved out to the building berth. The assembly includes a section of the main hull from which the brackets protrude.

Mr. Redshaw then described the launching process which takes place when the hull is sufficiently strong to withstand the stresses imposed. During the short launching run, the ship, which can weigh 13,000 tons attains a speed of about 15 knots and this, incidentally, is the fastest astern speed that the ship will attain in its whole career.

Concurrently with the hull building, the propelling machinery has been under construction and immediately the hull is afloat, the greater part of the heavy machinery is installed. The reciprocating steam engine is now almost obsolete for ship propulsion, and has been displaced by steam turbines or diesel engines. A modern express liner develops 42,500 shaft horse power and the geared steam turbine is unchallenged for passenger work of this kind.

Notable in recent times is the use of high steam pressures up to 850 lb. per sq. in. with superheat up to 1,000 degrees F. Pre-heating and the fitting of economisers has reduced fuel consumption to ½ lb. per horse power hour.

IMPORTANCE OF ELECTRICAL SYSTEM

In a modern ship the electrical system has grown to be a tremendous undertaking, having a large effect upon the time taken for completion of the ship. Practically all large liners are steered by means of electro-hydraulic gear. Other electrical gear comprises deck winches, radar, lighting, etc. The main generators are capable of meeting an all-out load of 3,400 kilowatts on some ships.

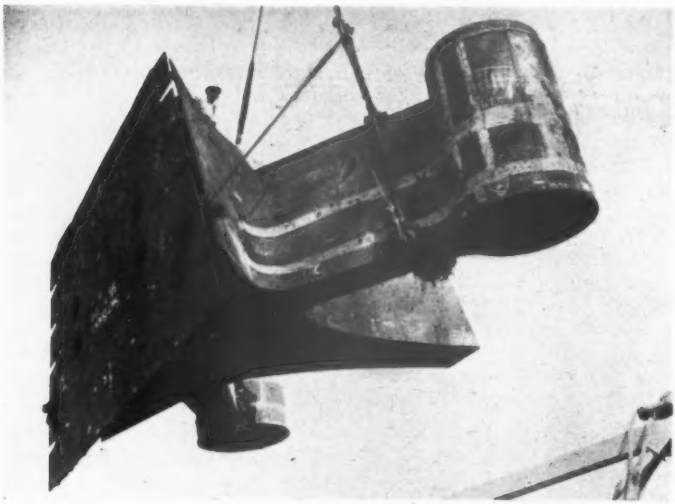
Mr. Redshaw concluded his paper with some facts about the Denny-Brown stabiliser which was recently built into a vessel. This device is designed to prevent or minimise the effects on passengers of rolling in heavy seas. It comprises retractable fins of airfoil section which protrude from both sides of the ship's hull below the water line. The angle of attack of the airfoil fins is adjustable and thus a lift is exerted upon the ship's hull on the low side of the rolling motion. The reverse effect takes place on the high side of the roll. The angle of attack varies constantly and automatically in response to the ship's motion, and the effect of the fins is to maintain the ship on a substantially even keel.

DISCUSSION

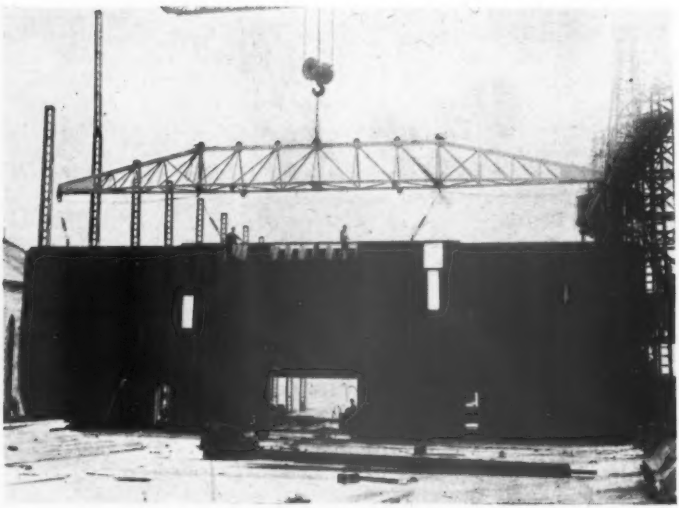
The President of the London Section then thanked Mr. Redshaw and called upon Sir Stanley Goodall, former Director of Naval Construction at the Admiralty, and former Assistant Controller for Warship Production, to open the discussion.

Sir Stanley pointed out that the Denny-Brown Stabiliser was worthy of fuller treatment and that Mr. Redshaw might be persuaded to amplify his remarks on it.

A shipbuilder must be acquainted with almost every branch of



5. Another view of the fabricated propeller brackets.



6. Large watertight bulkhead showing the special sling for lifting flexible structures.

engineering and must have some views on art. Electrical engineering played an important part in modern ship construction and it would be an advantage if parts of ships could be pre-fabricated complete with electrical gear and wiring.

Welding of ships really commenced in the 1914-18 War, and the first all-welded ship was built soon after the Armistice. The Washington Conference followed, limiting the weight of warships, and it was realised that welding could reduce weight by eliminating plate overlaps and rivets. Before World War II, welding was adapted extensively for warships and was in increasing use for merchant ships.

One reason why welding was used so extensively during the war was because of the shortage of skilled riveters. Without welding, the huge wartime programme of American ship construction would have been impossible. Government encouragement during the war was given to ship builders to alter their yards for welded construction because of the shortage of riveters. Many yards had difficulty in finding the extra space required for welding.

Changes in production methods gave rise to trade union troubles. A shipbuilder deals with about seventeen trades unions and troubles are mainly between one union and another and not between employer and labour. For instance, work has been at a standstill in a yard while the boiler-workers argued about who was to fit the pre-fabricated parts of the ship together.

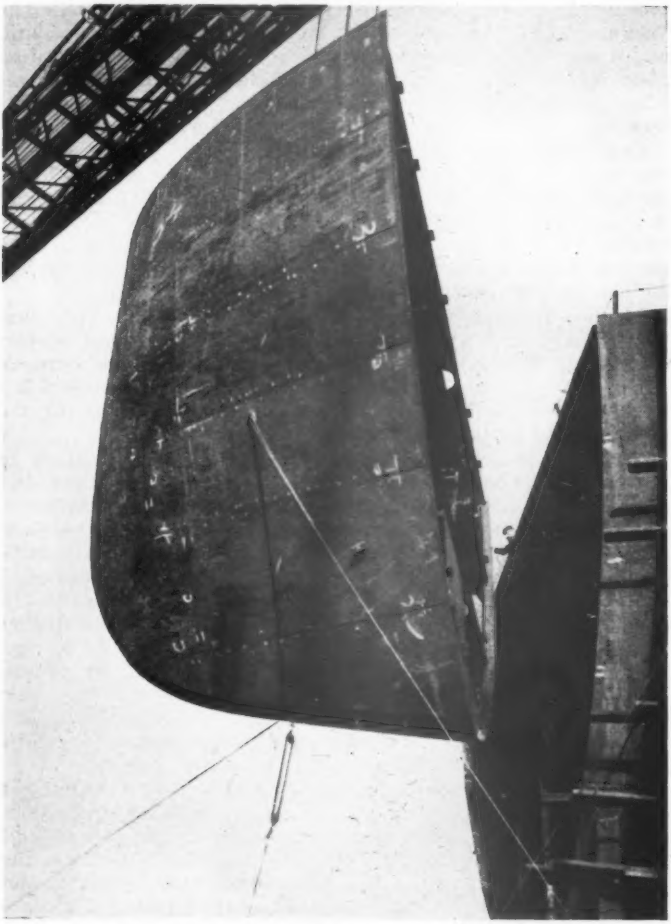
In reply, MR. REDSHAW said that wartime construction of submarines had been done in sections up to 60 tons in weight, and this procedure had reduced the occupation of building berths to one-third that required for building by the piece-meal method. Time was saved by keeping men continually occupied in constructing parts on a repetition basis, and after making four or five parts the time required for later parts was reduced by three-quarters. In Germany, sections had been built complete with electrical and other fittings. This tended to freeze designs and it would be for the Admiralty to decide whether the technique should be developed. Mr. Redshaw said that he did not wish to convey the impression that welding had risen suddenly in importance because of the last war. Welding was actually being dabbled with about sixty years ago.

MR. WARD asked if the elimination of rough hull joints resulted in a saving of horse power on a 25,000 ton liner. Also, did welding reduce time lost due to rain ? Was any stress relieving of welds carried out ? Were large tankers made without double bottoms, which is the case in some small tankers ? Was water testing still carried out and did the anti-rolling gear have any effect on the pitching of a ship ?

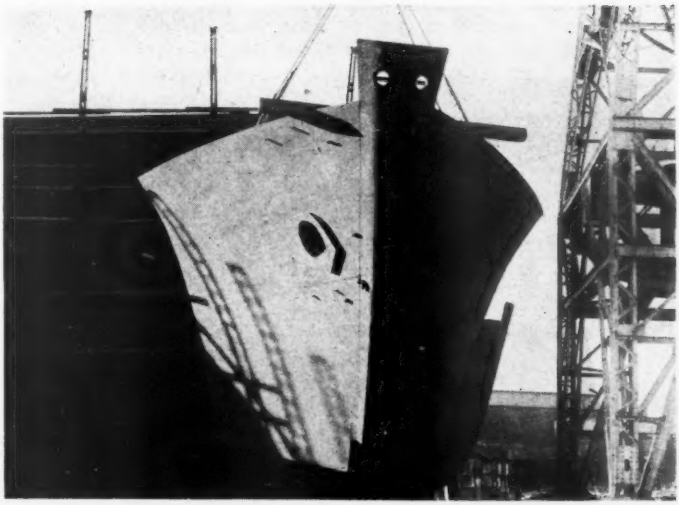
MR. REDSHAW replied that the stabiliser was not intended to influence the pitching of a ship, since it was placed in the middle of

the ship's length to give the maximum moment against rolling.

Water testing was done in welded tankers and there was almost complete freedom from leaks. Much time was saved because of this, since making up leaks in riveted hulls was an interminable job.



7. Stern extremity or " Counter " being lifted into position.



8. Bow end sub-assembly complete with hawse pipes and interior decks. The position into which it is being slung is immediately behind.

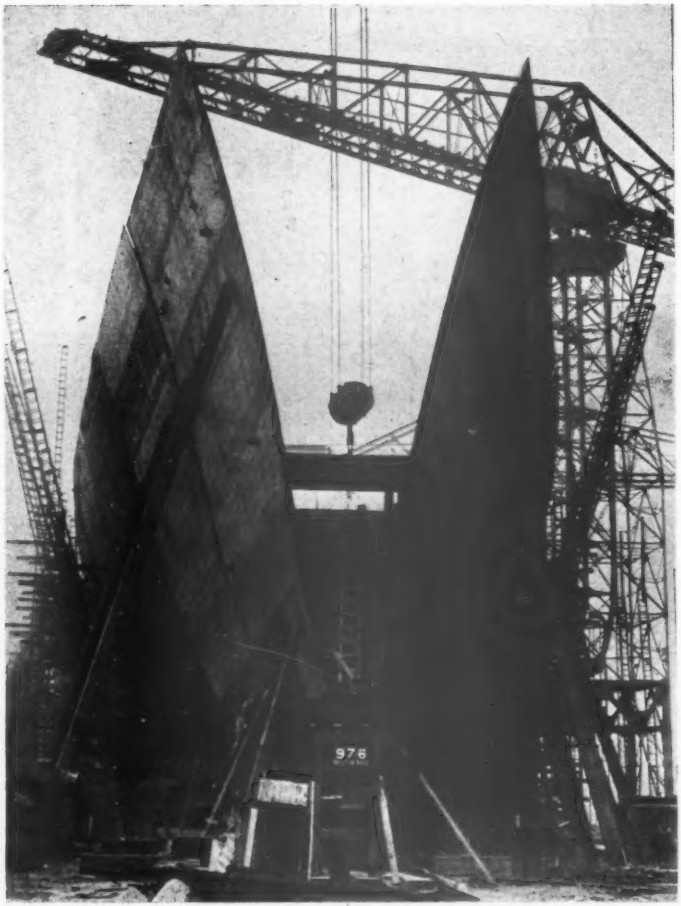
There were no double bottoms in modern tankers except at the aft end in the machinery space. The structure was usually framed longitudinally and the cargo was in contact with the ship's shell.

About stress relieving, Mr. Redshaw said that if the structure was put together in a good sequence, there was no need for stress relieving.

Weather had now very little effect upon ship construction since the smaller proportion of the work was now done outside. The major work could be performed in the welding shop and under cover.

Weight saved by welding varied in different types but probably averaged about 7½ to 10 per cent. of steel. In terms of displacement this was taking a few hundred tons from thirty odd thousand and the effect on propulsion therefore was not marked. Advantages of weight saving by means of welding were shown more particularly in cost of structural material and increase in deadweight or " pay load."

Mr. Ward asked if there was an appreciable reduction of drag owing to the smoother finish obtained by welding. Mr. Redshaw said that this was so.



9. Fore end of a liner, showing large panels of shell plating erected as pre-fabricated assemblies.

MR. MADELEY asked for the reasons why American ship yards had to be subsidised in order to stay in existence, and whether welding had resulted in a reduction of the hours required to produce a liner of a given tonnage as compared with pre-war.

MR. REDSHAW replied by saying that ship-building in America was at a fairly low ebb and the scale of development was behind that of Britain. The material to labour ratio of costs in a British ship was in the order of 2 : 1 but in the U.S.A. it was in the reverse order. Savings arising from new developments in ship construction were estimated to be a 40 per cent. increase in production per man-hour. That did not necessarily result in ships being built more cheaply then formerly, because cost was affected adversely by advancing time and piece rates and the reduced hours now worked.

MR. VIVIAN DAVIES asked if the Denny-Brown stabiliser increased the drag of the ship, and was it controlled by outside observation or was the control automatic. Why were ships not built in enclosed basins which could be flooded like dry docks ?

MR. REDSHAW said that it was uneconomic to use a dry dock or heavy capital cost for building a ship and the present method of building on the foreshore and sliding the ship into the water was the best from many viewpoints.

On the Denny-Brown stabiliser, Mr. Redshaw said that the control gear was automatic and that the fins were extended hydraulically and could be withdrawn into the hull in calm water when they were not required. A two-position control switch was used. One position provided for a quick period of encounter with the waves. The other position was for a following sea which was a longer or slower period of encounter. The control gear automatically adjusted the fin movements to suit the conditions, and provided that seas of regular frequency were encountered, the control gear would continue to operate to the best advantage without attention.

Despite the airfoil shape of the fin, some drag was to be expected, but it was claimed that the reduction of rolling helped to compensate for this.

MR. HILLS said that from the slides it seemed that there was no keel and simply a broad cross section of girders. Was the keel now obsolete ? Was the flat-bottomed hull superior to the round-bottomed type ? Was much trouble experienced in matching up the parts since the edges are not bolted or riveted ? How were the edges matched so smoothly ?

MR. REDSHAW replied that the keel was now merged into other parts of the structure. The keel or backbone was still the main centre girder and was useful for supporting the ship when it was dry-docked. The bottom shape was related to factors such as speed and displacement. Round or flat bottoms could be made equally stable.

Matching up shapes was one of the tricks of the trade and was the work of loftsmen, shipwrights and platers.

MR. PORTER asked a question about the accuracy of turbine reduction gearing, and MR. REDSHAW passed the question to MR. LAURENS, who said that the accumulated inaccuracy in the circumference of a large marine gear wheel was now about 0.005 in. The greatest difficulty was the helix angle and the matching up with the pinion.

MR. KIRCHNER moved a vote of thanks to MR. REDSHAW, and wondered whether theodolites and similar instruments were used to check the accuracy of ship assemblies. MR. REDSHAW replied that they were.

"A CRANE BUILDER'S OUTLOOK ON THE DESIGN OF ELECTRIC OVERHEAD CRANES"

By JOHN BAKER, M.B.E., M.I.Mech.E., M.I.C.E.*

Presented to the Sheffield Section of the Institution, 15th January, 1951

PRODUCTIVE Efficiency is that elusive factor, in search of which we tour the U.S.A., gather statistics, plot curves, write reports and receive Ministerial directives, without ever being able to define just exactly what we mean by Productive Efficiency.

To a crane builder who is out to sell his product it means the right job at the right price. In this country high pressure salesmanship is a failure unless the product does the job it is supposed to do to the user's satisfaction. The user's satisfaction is sometimes fickle. In the days when all crane gears were noisy there were no complaints of noise ; to-day, when by comparison all gears are silent, a small noise is a source of complaint.

If, out of three makers of similar standing quoting for a crane, two quote £1,000 and the third £900, the buyer is quite satisfied with the offer at £900. It does not follow that any of the three are making their cranes efficiently, and as all makers will be offering quiet gearing the buyer does not realise just how much extra it has cost to incorporate this highly desirable feature.

We lay out our factories on modern lines, we install the best plant, we run up-to-date planning and progress systems, and we see good balance sheets. We are entitled to say that we are producing efficiently, and yet, I sometimes wonder if we are as efficient as we think we are.

The crane industry is very competitive and this factor no doubt keeps the industry as a whole efficient. Many cranes are individually built pieces of machinery and the prices for these and other handmade articles have soared to levels which would have seemed incredible fifteen to twenty years ago.

It is sometimes said that craftsmanship is dying, but one has only to look at present day British Engineering products to realise that this statement is untrue. Admittedly times have changed ; a craftsman is not needed to operate a modern machine tool but he is there behind the scenes all the time, designing, planning and tooling up. Without him modern production would not be possible. Surely

* Managing Director, Joseph Booth & Bros., Leeds

with our enterprise and skill, and the wonderful production tools and equipment which we have at our disposal, it ought to be possible to find ways and means of making cranes on a basis that will give a high enough " man hour output " to offset, or rather to justify, the high wages bill.

It is fairly obvious, however, that under present day conditions, whilst it is always possible to make improvements in plant layout and methods of manufacture which will show beneficial results, concentration on this side of the problem alone will not produce enough saving to give the desired result. The whole problem must be considered from wider angles if any major improvement in efficiency is to be an ultimate possibility.

These remarks will illustrate the lines on which I have been thinking for the last two or three years, and form the basis of my talk to-night.

FUNDAMENTAL FEATURES

Production efficiency experts urge us to curtail the range of our products and to batch produce our output on a limited number of types, but this would still leave a large number of cranes " off standard " which users must have, so that if this policy is run to excess the customer might even have to pay more in the global total. Moreover, it is dangerous to concentrate on a too limited range, as the demand for a particular type of crane has a habit of changing as capital development works round from say, steelworks to railways, docks, public works, etc. Yet ways and means must be found for batch production, as it is the only way to use modern machinery to its full advantage.

Before going further it is advisable to consider the essential functional conditions of an overhead crane. It must be clearly understood that these features take preference over facility of manufacture and initial cost :

1. Safety.

2. A crane must be capable of carrying out the work required by the user.

This feature can be sub-divided into :—

(a) Correct speeds for the duty required.

(b) Sufficient allowance for strength and wear to cover the required working life of the crane.

(c) Handiness and ease of operation.

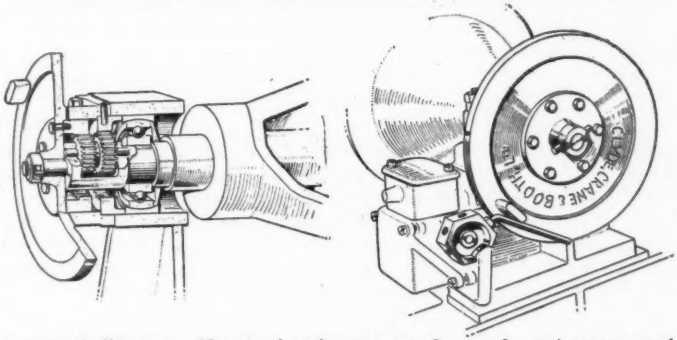
3. Freedom from mechanical and electrical breakdown.

4. Ease of access for repairs and maintenance.

It must be recognised that even the best design and the most carefully made crane will from time to time require maintenance ;

it must be possible to replace worn or damaged parts with the minimum amount of trouble. This is especially important in crane work as men are working above floor level, and a job which may be easy at floor level can be very difficult at a height. Under present-day conditions however, the crane designer can be permitted to seal up some items provided unit construction is maintained and the unit itself can be changed quickly and easily.

For instance, there does not seem to be any argument in favour of changing a motor armature on a crane ; it is the whole motor unit which should be changed. Overwinding gear should be made so that it can be changed over as a unit, and similarly cross traverse and long travel gear boxes are better if they are dealt with as units.



1. Overwinding gear. Note total enclosure, ease of access for maintenance and unit construction.

In the case of a hoist gear box, however, which is too large a piece to be considered as a unit, then it is essential that parts can be dismantled with the gear box on the crane.

5. A crane must have sufficient access for easy inspection. This is particularly important now that we have totally enclosed gears which cannot be seen on a normal walk round ; it is also particularly important for users who maintain their plant on preventative maintenance system.

6. A crane must have adequate access for lubrication and adjustment of such items as brakes. It is not certain, however, that automatic lubrication on the " one shot " system is an advantage under all circumstances ; ball and roller bearings do not want greasing daily, they want packing with grease, say, once every six months. It is important to make sure that the grease does get into the bearing, which it may not do if a " one shot " system is only operated say twice a year. On the other hand plain bearings must be lubricated at much more frequent intervals. Where a crane

is on heavy duty, then remote controlled greasing either entirely automatic or by " one shot " system is the only means of ensuring an adequate supply of lubricant, particularly on a large crane where individual greasing methods may take several hours a day.

7. A crane must comply with statutory regulations, which in this country means the 1937 Factory Act. At one time or another most crane-makers and users have complained that this Act has not made our cranes safer ; all that it has done is cover them up and make them inaccessible for repairs and maintenance. It has also certainly made them much more expensive. Taking a long term view, however, it could be said that the 1937 Factory Act has been the crane-maker's best friend ; it has created the opportunity to enclose gears in a proper manner, the ultimate product being far superior to any cranes which had open type gearing with shafts mounted on loose pedestal bearings.

Admittedly there are problems such as guarding the long travel shaft, but there is more to say about this later.

STANDARD BASIC DESIGNS

Efforts to standardise overhead cranes in the past have failed, largely due to the fact that the designer did not take care of the large range of different duties required from an overhead crane. In most cases the design was built down to a price and was too light for many applications. It was difficult for the maker building a heavier duty crane to prove to his clients just how and why the extra cost of his product was justified.

The fact that the engineer buyer had no guide to duty has led to the customer putting out his own specification, laying emphasis on certain individual features, with the result that any attempt to standardise and at the same time meet the special requirements of these specifications has been completely impossible.

More recently the Company with which the author is connected has standardised overhead cranes on the basis of a service factor, and basic design data has been got out on the lines of Table I. The service factor is much on the lines of the ball bearing duty factor. Take, for instance, a Class II crane ; this series of cranes is designed with wear factors to correspond with 3,000 hours service per annum, or 30,000 hours over a period of ten years.

Experience with the use of this chart is interesting, because it is found that the user nearly always tends to overestimate his duty cycle.

If users can once be assured that a crane of a given class will give the service stated, it will ultimately be the means of a big saving in first cost from a purchaser's point of view.

Having fixed basic design data the next step is to fix standard clearances and standard speeds as indicated on Tables No. II, III and IV.

CLASS	MAX HOURS PER ANNUM	STRESS FACTOR	DYNAMIC FACTOR	RATIO OF BREAKING LOAD OF ROPES TO MAX LOAD	RATIO OF PULLEYS & DRUM TO ROPE SIZES	MOTION	DESIGN FACTOR FOR GEARS To BSS 436		MINIMUM MOTOR RATINGS		LT MOTION MEAN ACCEL FT./SEC.²
							STRENGTH	WEAR			
0	1,000	1·0	1·1	5 :1	16 :1				½ HOUR		0·7
I	2,000	1·0	1·2	6 :1	19 :1				½ HOUR		0·7
II	3,000	1·0	1·4	6 :1	19 :1	H.	1·6	0·3	1 HOUR		0·9
						C.T.	1·6	0·4	½ HOUR		
						L.T.	1·6	0·5	½ HR OR 1HR.		
III	4,000	0·92	1·6	7 :1	25 :1	H.	1·8	0·4	1HR. OR RMS	MINIMUM 1 HOUR	1·2
						C.T.	1·8	0·5	1 HOUR.		
						L.T.	1·8	0·7	1HR. OR RMS		
IV	5,000	0·84	1·8	8 :1	25 :1	H.	2·0	0·6	RMS		1·5
						C.T.	2·0	0·7	RMS		
						L.T.	2·0	0·8	RMS		

R.M.S.

2. Table I. Basic design data.

(Courtesy of Machine Shop Magazine)

Overhead cranes made by the author's company have been divided into five classes :—

Class O. Light-duty cranes. Primarily hand-operated.

Class I. Medium-duty industrial cranes. For intermittent work in stores and light machine shops.

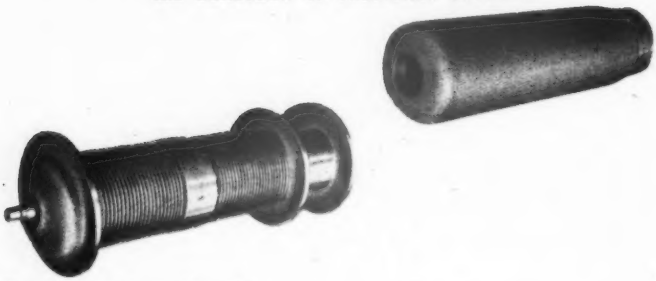
Class II. Heavy-duty industrial cranes.—Capable of continuous use in non-ferrous and light iron foundries, heavy engineering works and stockyards. They comply with B.S.S. 466/1947 and usually have one-hour rated motors on the hoist and long travel motions.

Class III. Steelworks process and service cranes. Generally have higher speeds than Class II cranes and are for maintenance work in steelworks and for process work in the lighter sections of the steel industry ; they are suitable for light magnet or grabbing duty. Maximum permissible stresses for the structure are lower than for Class II cranes ; a greater fatigue allowance is made for members subject to reversal of stress. The service factor for gears and bearings is higher than for Class II cranes. They can be fitted with mill motors.

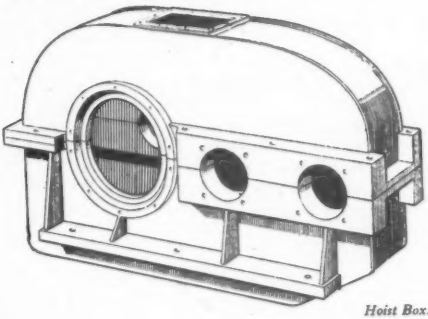
Class IV. Steelworks continuous process cranes. Designed to handle the input or output of a furnace or mill where the cranes are in continuous use and form a link in the process. They are suitable for box lifting, magnet work, grabbing duty and such work involving a high root mean square (R.M.S.) rating. The maximum permissible stresses are lower and the wear allowances are higher than those for Class III cranes. Mill motors are usually used.

Under emergency conditions and **when proper precautions are taken,** loads heavier than the rated maximum can be lifted. Maximum overloads **under observed conditions** are :—

Class I Cranes—10 per cent. above working load.
Class II Cranes—25 per cent. above working load.
Class III Cranes—35 per cent. above working load.
Class IV Cranes—50 per cent. above working load.



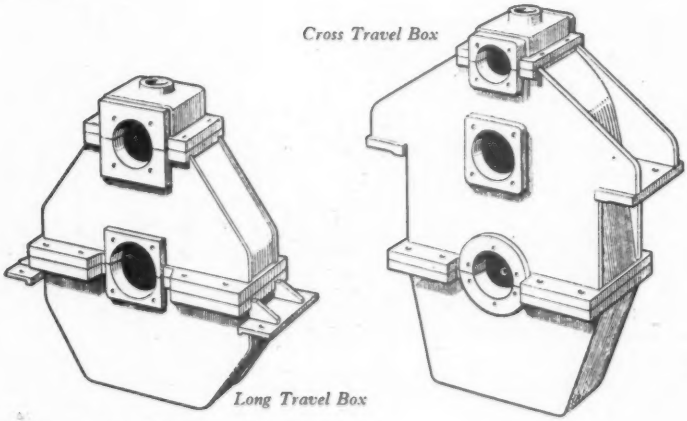
3. Booth overhead crane barrels.



Hoist Box.

4. Hoist gear box.

Cross Travel Box



Long Travel Box

5. Cross travel and long travel gear boxes.

It can be seen from the tables that the standard speeds are all based on motors running at 750 r.p.m. ; two additional speeds are available by selecting motors at 600 or 1,000 r.p.m., thus eliminating any necessity for changing gear ratios. This arrangement maintains the same motor frame sizes, it is only the windings which differ.

Very careful thought has been given to selecting the correct speeds for the various classes of cranes. A point that is usually overlooked is that if for some reason the maximum speed which can be offered as standard is too slow, then a faster speed is required because the service factor is higher than that given by that particular class, and a crane with a higher service factor is required.

It is perhaps not realised how much an increase in speed affects the design of an overhead crane. Supposing the speed of hoisting is increased by 50 per cent., up goes the size and weight of the hoist motor and gearing ; this may mean a larger crab frame, certainly a heavier one, and this in turn means increasing the girder sections. If the design is to remain a balanced one, the long travel gear must also go up in order to maintain the same performance and service factors. From this it will be realised that from all aspects it pays to keep to the speed ranges offered.

Referring again to the service factor, it should be noted that a crane actually in motion 20 hours a day seven days a week for 50 weeks per annum works 7,000 hours, the theoretical maximum possible, of course, under continuous running, is 8,760.

There is a record of one crane working 8,000 hours per annum and there are a few cranes working over 7,000. These cranes, however, are exceptional and come outside the scope of any question of a basic design, and it will be found that a Class IV crane covers the requirements of very strenuous steel works service.

Very few cranes are actually in motion over 96 hours per week for 50 weeks a year. This works out at 4,800 hours per annum which is inside 5,000 hours service factor of the Class IV crane. From a point of view of standardisation there is no object in considering anything in excess of 5,000 hours.

As a side issue on service factor it should be noted that overhead cranes used in industry have a much heavier duty cycle than, say, a dockside crane. This type of crane is used intensively for short periods, and is then subject to standing times when there is no work to be done. Few dock cranes average more than 3,000 hours per annum over a period of 10 years, with the exception of one or two special transporters on the Great Lakes and even these machines come inside a service factor of 4,000 hours per annum.

MANUFACTURING CONSIDERATIONS

To get efficient production under present-day conditions the crane-maker has to alter his ideas a good deal from those prevailing before the war.

First, a crane must be built so that it is an assembly, not a hand-

TABLE II

The dimensions given are building dimensions and not the room occupied by the crane. Reference "A", "B", and "C" refer to diagrams on next page.

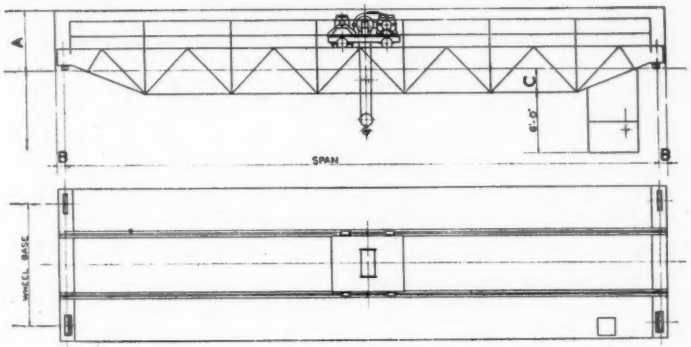
BUILDING CLEARANCES FOR STANDARD CRANES

	SPAN.	CAPACITY. TONS	3	5	7½	10	15	20	25	30	40	50	75	100	125	150	175	200
CLASS I	UP TO 40'-0"	HEADROOM A	4'-6"	5'-0"	5'-6"	6'-3"	6'-6"											
		ENDROOM B	9"	9"	9"	9"	10"											
		BELOW RAIL C	←			ZERO							→					
	TO 80'-0"	HEADROOM A	4'-9"	5'-3"	5'-9"	6'-6"	6'-9"											
		ENDROOM B	9"	9"	9"	9"	10"											
		BELOW RAIL C	4'-3"	4'-3"	4'-3"	4'-3"	4'-3"											
	TO 120'-0"	HEADROOM A	5'-0"	5'-6"	6'-0"	6'-9"	7'-0"											
		ENDROOM B	9"	9"	9"	9"	10"											
		BELOW RAIL C	6'-6"	6'-6"	6'-6"	6'-6"	6'-6"											
CLASS II	UP TO 40'-0"	HEADROOM A		5'-3"	5'-9"	6'-6"	6'-9"	6'-11"	7'-1"	7'-3"	7'-5"	8'-3"						
		ENDROOM B		10"	10"	10"	12"	12"	14"	14"	15"	15"						
		BELOW RAIL C		2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"	2'-3"						
	TO 80'-0"	HEADROOM A		5'-6"	6'-0"	6'-9"	7'-0"	7'-2"	7'-4"	7'-6"	8'-0"	8'-6"						
		ENDROOM B		10"	10"	12"	12"	14"	14"	15"	15"	16"						
		BELOW RAIL C		4'-6"	4'-6"	4'-6"	4'-6"	4'-6"	4'-6"	4'-6"	4'-6"	4'-6"						
	TO 120'-0"	HEADROOM A		5'-9"	6'-3"	7'-0"	7'-3"	7'-5"	7'-7"	7'-9"	8'-3"	8'-9"						
		ENDROOM B		10"	12"	12"	14"	14"	15"	15"	16"	16"						
		BELOW RAIL C		6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"	6'-9"						
CLASS III	UP TO 40'-0"	HEADROOM A		5'-6"	6'-0"	6'-9"	7'-0"	7'-2"	7'-2"	7'-4"	7'-10"							
		ENDROOM B		13"	14"	14"	14"	15"	15"	16"	16"							
		BELOW RAIL C		2'-9"	2'-9"	2'-9"	2'-9"	2'-9"	2'-9"	2'-9"	2'-9"							
	TO 80'-0"	HEADROOM A		6'-0"	6'-6"	7'-9"	7'-11"	8'-0"	8'-3"	8'-6"	8'-9"							
		ENDROOM B		14"	14"	14"	15"	15"	16"	16"	16"		CONSULT CRANE MAKER FOR					
		BELOW RAIL C		4'-10"	4'-10"	4'-10"	4'-10"	4'-10"	4'-10"	4'-10"	4'-10"		CLEARANCES THIS SIDE OF LINE.					
	TO 120'-0"	HEADROOM A		6'-2"	6'-8"	7'-5"	8'-0"	8'-1"	8'-4"	8'-7"	8'-10"							
		ENDROOM B		14"	14"	14"	15"	15"	16"	16"	16"							
		BELOW RAIL C		6'-10"	6'-10"	6'-10"	6'-10"	6'-10"	6'-10"	6'-10"	6'-10"							
CLASS IV	UP TO 40'-0"	HEADROOM A																
		ENDROOM B																
		BELOW RAIL C																
	TO 80'-0"	HEADROOM A																
		ENDROOM B																
		BELOW RAIL C																
	TO 120'-0"	HEADROOM A																
		ENDROOM B																
		BELOW RAIL C																

NOTE.—The table of clearances gives dimensions required in the building to enable the crane maker to design a crane with correct wheel bearing dimensions, good end approaches and normal proportions.

Increased head room is required on cranes with exceptional heights of lift as a larger diameter barrel than standard has to be fitted.

Building designers are strongly recommended to adhere to these dimensions,



fitted job. This means much more accurate work from machine tools, not at all a difficult achievement with modern machines. It means a system of limits and fits and measuring equipment to make the limits practicable. It means finish grinding shafting, and shop drawings with toleranced dimensions. This last item is the most serious where special cranes are concerned, as it embraces not only the cost of making drawings properly broken down for shop use but the time taken to produce them, and I think the day is not far off when a crane-maker will have to have two drawing offices—one office to produce the design and the other to break the drawings down into shop drawings.

Designs embodying loose pedestal bearings and rigid type flanged couplings must be gradually eliminated, as these items do not lend themselves to unit assembly and require hand fitting on final assembly to secure true alignment.

On the other hand, for standard cranes it is a problem to supply a customer with a set of " as made " drawings. A standard crane is assembled from a series of stock components and no detail drawings of the crane as a whole are in existence, so that the " as mades " have to be made specially at the expense of so much lost productive labour in the drawing office. This difficulty can be overcome if customers will accept scale outline drawings with dimensioned arrangement drawings off standard sheets ; after all, this is only in line with other engineering work. What diesel engine maker or electric motor maker will today supply complete detail drawings ?

CONTROL Today users, quite rightly, are expecting something much better than the rough control usually associated with A.C. resistance starting. The B.T.H. thruster has made available an

CLASS I 3 MOTOR CRANES							WEIGHTS & WHEEL LOADS ETC.
LIFTING CAPY TONS		SPAN					
		30'-0"	40'-0"	50'-0"	60'-0"	70'-0"	80'-0"
3	WEIGHT TONS	8½	10	13½	16	17½	23
	WHEEL LOAD TONS	4	4¼	5¼	5¾	6⅛	7½
	WHEEL DIA	15"	15"	15"	15"	15"	15"
	WHEEL BASE	7'-0"	8'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD	56	56	56	56	56	56
5	WEIGHT TONS	9½	11	14½	17	19	27
	WHEEL LOAD TONS	5⅛	5½	6½	7	7½	9½
	WHEEL DIA	15"	15"	15"	15"	15"	15"
	WHEEL BASE	7'-6"	8'-6"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD	56	56	56	56	56	56
7½	WEIGHT TONS	11	13	17	18½	21½	29
	WHEEL LOAD TONS	6¾	7¼	8¼	8½	9½	11¼
	WHEEL DIA	15"	15"	15"	15"	15"	15"
	WHEEL BASE	8'-9"	9'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD	56	56	56	56	56	56
10	WEIGHT TONS	11½	14	19	21	24	32
	WHEEL LOAD TONS	8¼	9	10	10½	11¾	13¼
	WHEEL DIA	15"	15"	15"	15"	15"	15"
	WHEEL BASE	8'-9"	9'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD	56	56	56	56	56	56
15	WEIGHT TONS						
	WHEEL LOAD TONS						
	WHEEL DIA						
	WHEEL BASE						
	L T RAIL LBS/YD						

7. Table III. Weights and wheel loads for standard cranes.

CLASS II 3 MOTOR CRANES							WEIGHTS WHEEL LOADS ETC
LIFTING CAPY TONS		SPAN					
		30'-0"	40'-0"	50'-0"	60'-0"	70'-0"	80'-0"
5	WEIGHT TONS	10	11½	16	18½	20½	24½
	WHEEL LOAD TONS	5¼	5⅝	6⅞	7⅞	8	9
	WHEEL DIA	15"	15"	15"	15"	15"	15"
	WHEEL BASE	7'-6"	8'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD	56	56	56	56	56	56
7½	WEIGHT TONS	12	14	19	21	24	29
	WHEEL LOAD TONS	7	7½	8⅛	9½	10	11⅛
	WHEEL DIA	15	15"	15"	15"	15"	15"
	WHEEL BASE	8'-0"	8'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD	56	56	56	56	56	56
10	WEIGHT TONS	12½	15	21	24	27	32
	WHEEL LOAD TONS	8½	9¼	10½	11½	12⅛	13½
	WHEEL DIA	15"	15"	15"	15"	15"	15"
	WHEEL BASE	8'-0"	8'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD	56	56	56	56	56	56
15	WEIGHT TONS		21	26	29	32	36
	WHEEL LOAD TONS		13¼	14½	15⅛	16	17
	WHEEL DIA		18	18	18	18	18
	WHEEL BASE		9'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD		56	56	56	56	56
20	WEIGHT TONS		24	28	32	35	40
	WHEEL LOAD TONS		16½	17½	18½	19¼	20½
	WHEEL DIA		18	18	18	18	18
	WHEEL BASE		9'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD		56	56	56	56	56

7. Table III. Weights and wheel loads for standard cranes.

CLASS II 3 MOTOR CRANES			WEIGHTS WHEEL LOADS ETC.					
LIFTING CAPY TONS		SPAN						
		30'-0"	40'-0"	50'-0"	60'-0"	70'-0"	80'-0"
25	WEIGHT TONS		28	32	35	39	43
	WHEEL LOAD TONS		20	21	21½	22½	23½
	WHEEL DIA		18"	21"	21"	21"	21"
	WHEEL BASE		9'-6"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD		70	70	70	70	70
30	WEIGHT TONS		30	35	38	41	46
	WHEEL LOAD TONS		23	24	25	25¾	27
	WHEEL DIA		21"	21"	21"	21"	24"
	WHEEL BASE		9'-6	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD		70	70	70	70	70
40	WEIGHT TONS		35	38	42	45	50
	WHEEL LOAD TONS		29	30	31	31¾	33
	WHEEL DIA		24"	24"	27"	27"	27"
	WHEEL BASE		10'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD		70	70	70	70	70
50	WEIGHT TONS		38	41	45	49	55
	WHEEL LOAD TONS		34½	35	36½	37½	39
	WHEEL DIA		30"	30"	30"	33"	33"
	WHEEL BASE		10'-0"	10'-0"	12'-0"	12'-0"	13'-6"
	L T RAIL LBS/YD.		70	70	70	70	70

7. Table III, Weights and wheel loads for standard cranes.

CLASS II 4 MOTOR CRANES				WEIGHTS & WHEEL LOADS				
LIFTING CAPACITY			SPAN					
MAIN HOIST	AUX HOIST		40'-0"	50'-0"	60'-0"	70'-0"	80'-0"
40	5	WEIGHT TONS	38	42	47	50	56
		WHEEL LOAD TONS	32	33	34	35	36
		WHEEL DIA	24"	24"	27"	27"	27"
		WHEEL BASE	10'-0"	10'-0"	12'-0"	12'-0"	13'-6"
		L T RAIL LBS/YD	70	70	70	70	70
50	5	WEIGHT TONS	41	45	50	54	61
		WHEEL LOAD TONS	37½	38	39½	41	49
		WHEEL DIA	30"	30"	30"	33"	33"
		WHEEL BASE	10'-0"	10'-0"	12'-0"	12'-0"	13'-6"
		L T RAIL LBS/YD	70	70	70	70	70
75	7½	WEIGHT TONS				68	
		WHEEL LOAD TONS				38 *	
		WHEEL DIA				33"	
		WHEEL BASE				16'-0"*	
		L T RAIL LBS/YD.				70	
100	10	WEIGHT TONS				80	
		WHEEL LOAD TONS				47 *	
		WHEEL DIA				33"	
		WHEEL BASE				19'-0"*	
		L T RAIL LBS/YD				70	

7. Table III. Weights and wheel loads for standard cranes.

CLASS II 4 MOTOR CRANES — WEIGHTS AND WHEEL LOADS							
LIFTING CAP!			SPAN				
MAIN HOIST	AUX HOIST		40-0	50-0	60-0	70-0	80-0
125	15	WEIGHT TONS				91	
		WHEEL LOAD TONS				57 *	
		WHEEL DIA				36	
		WHEEL BASE				22'-0"*	
		L.T.RAIL LBS/YD				112	
150	20	WEIGHT TONS				102	
		WHEEL LOAD TONS				70 *	
		WHEEL DIA				36	
		WHEEL BASE				24-0"*	
		L.T.RAIL LBS/YD				112	
175	20	WEIGHT TONS					
		WHEEL LOAD TONS					
		WHEEL DIA					
		WHEEL BASE					
		L.T.RAIL LBS/YD					
200	20	WEIGHT TONS					
		WHEEL LOAD TONS					
		WHEEL DIA					
		WHEEL BASE					
		L.T. RAIL LBS/YD					

7. Table III. Weights and wheel loads for standard cranes.

inexpensive form of slow speed control on slipring motors. Squirrel cage motors are at present out of the question except for very small cranes, and unless there is some entirely new development on A.C. it looks as if we shall eventually get back to D.C. cranes.

Feeding A.C. to a crane fitted with D.C. motors, with a valve rectifier with grid voltage control as an intermediary and microhm resistances, is a picture which we may be able to put into effect in the not very distant future.

MOTORS Put into its simplest form, a motor must have sufficient torque for the duty required and sufficient cooling capacity to get rid of the heat losses in the windings. On a crane neither of these factors need have any bearing on the usual horse-power rating given on the motor name plate. For example, on the long travel motion on a high speed magnet crane, the power required to travel may be 100 h.p. but when the operating cycle is worked out fully it may be found that the motor must give at least $2\frac{1}{2}$ times full load torque in order to get the desired acceleration. If the crane is on short runs, the R.M.S. current in the windings will be well above the name plate full load current and even a continuously rated motor at 100 h.p. will not look at the job. But if

torque and temperature rise are taken fully into account, then crane work is not heavy duty for a motor and there does not appear to be any need for mill motors. Not only are they expensive but they are heavy and this extra weight goes right through the crane.

It is important, however, that crane motors are designed for crane work ; they must give a high starting torque, have low inertia armatures or rotors and be mechanically strong enough to withstand constant braking and reversing.

In a works it is desirable from the point of limiting spares to keep the number of motor sizes down to a minimum. In the author's opinion this practice should not be run to the extent of using an obsolete type of motor. One or two firms, for the sake of duplication, fit motors to new cranes which became obsolete twenty years ago. Apart from the fact that the performance of these machines is not up to present-day standards, the cost of repeating designs which are no longer in production is almost twice the cost of the modern equivalent.

GIRDERS

For medium and long spans the Warren type girder with its horizontal outrigger girder is more economical than a double web box girder. An investigation, which it is hoped will be undertaken shortly, is required to check the stress distribution in a lattice crane girder. Once this has been done it is fairly certain that it will be possible to design a still more economical girder. On the question of weight saving in girders, there are two schools of thought. The first contends that " the saving can't be more than 10% of the girder weight, which may only be 5% of the total crane weight ; a 5% saving on material only costing £22 per ton is not worth the cost of the investigation." The other school, to which the author belongs, maintains that " cranes are too heavy and ways must be found of saving weight all round, without reducing the strength in any way. This weight saving would reduce wear on mechanical parts and would also lighten the buildings that carry the cranes."

The crane designer has still considerable scope for weight saving, such as the use of light alloy for platforms and hand rails.

In crane design we cannot design against failure, that is, to make a girder which will actually stand a given proof loading of something in excess of the maximum possible loading that can occur under working conditions, and so long as the girders will stand up to the proof loading, the calculated stresses can be ignored.

The stresses in a crane girder must be analysed and a set of rules and formulae worked out which will allow the designer to apply these formulae and produce girders of varying spans and loadings with similar stress characteristics. In the past we have only been able to get rough and ready checks on stress distribution, but with

CLASS I. 3 MOTOR CRANES						SPEEDS & H.P OF MOTORS					
LIFTING CAPTY TONS	HOIST SPEED FT/MIN.	HOIST H.P.	CRAB SPEED FT/MIN.	CRAB H.P.	LONG TRAVEL	SPAN					
						30'-0"	40'-0"	50'-0"	60'-0"	70'-0"	80'-0"
3	24	6	80	1½	WEIGHT TONS	8½	10	13½	16	17½	23
					SPEED F.P.M.	250	250	250	250	250	250
					H.P.	6	7	8	10	10	13
5	24	10	80	2	WEIGHT TONS	9½	11	14½	17	19	27
					SPEED F.P.M.	250	250	250	250	250	250
					H.P.	8	8	10	11	12	16
7½	24	15	80	2½	WEIGHT TONS	11	13	17	18½	21½	29
					SPEED F.P.M.	250	250	250	250	250	250
					H.P.	9	10	12	13	15	18
10	24	20	80	3	WEIGHT TONS	11½	14	19	21	24	32
					SPEED F.P.M.	250	250	250	250	250	250
					H.P.	11	12	15	16	17	21
15	20	25	80	5	WEIGHT TONS						
					SPEED F.P.M.	250	250	250	250	250	250
					H.P.						

8· Table IV. Speeds and horse powers of motors.

CLASS II. 3 MOTOR CRANES						SPEEDS & H.P OF MOTORS					
LIFTING CAPTY TONS	HOIST SPEED FT/MIN	HOIST H.P	CRAB SPEED FT/MIN	CRAB H.P	LONG TRAVEL	SPAN					
						30'-0"	40'-0"	50'-0"	60'-0"	70'-0"	80'-0"
5	24	10	100	2	WEIGHT TONS	10	11½	16	18½	20½	24½
					SPEED F.P.M.	300	300	300	300	300	300
					H.P	10	10	15	15	20	20
7½	24	15	100	3	WEIGHT TONS	12	14	19	21	24	29
					SPEED F.P.M.	300	300	300	300	300	300
					H.P.	15	15	20	20	20	25
10	24	20	100	4	WEIGHT TONS	12½	15	21	24	27	32
					SPEED F.P.M.	300	300	300	300	300	300
					H.P.	15	15	20	25	25	30
15	20	25	100	6	WEIGHT TONS		21	26	29	32	36
					SPEED F.P.M.		300	300	300	300	300
					H.P		25	25	30	30	35
20	15	25	100	7½	WEIGHT TONS		24	28	32	35	40
					SPEED F.P.M.		250	250	250	250	250
					H.P		25	25	30	30	35
25	12	25	100	9	WEIGHT TONS		28	32	35	39	43
					SPEED F.P.M.		250	250	250	250	250
					H.P		30	30	35	35	40
30	12	30	100	10	WEIGHT TONS		30	35	38	41	46
					SPEED F.P.M.		250	250	250	250	250
					H.P		35	35	35	40	40
40	8½	30	100	14	WEIGHT TONS		35	38	42	45	50
					SPEED F.P.M.		225	225	225	225	225
					H.P		40	40	40	45	45
50	7	30	100	17	WEIGHT TONS		38	41	45	49	55
					SPEED F.P.M.		200	200	200	200	200
					H.P		40	40	40	45	45

8. Table IV. Speeds and horse powers of motors.

CLASS II. 4 MOTOR CRANES									SPEEDS & H.P OF MOTORS.				
LIFTING CAPACITY		MAIN HOIST		AUX HOIST		CRAB SPEED FT/MIN	CRAB H.P	LONG TRAVEL	SPAN				
MAIN HOIST	AUX HOIST	SPEED FT/MIN	H.P	SPEED FT/MIN	H.P				40'-0"	50'-0"	60'-0"	70'-0"	80'-0"
40	5	8½	30	48	20	100	16	WEIGHT TONS	38	42	47	50	56
								SPEED FPM	225	225	225	225	225
								H.P	40	40	45	45	50
50	5	7	30	48	20	100	20	WEIGHT TONS	41	45	50	54	61
								SPEED FPM	200	200	200	200	200
								H.P	40	40	45	45	50
75	7½	6	45	48	30	75	20	WEIGHT TONS				68	
								SPEED FPM		150	150	150	150
								H.P				50	
100	10	5	50	40	35	60	20	WEIGHT TONS				78	
								SPEED FPM				150	150
								H.P				60	
125	15	4	50	40	50	50	20	WEIGHT TONS				87	
								SPEED FPM				100	100
								H.P				50	
150	20	4	60	30	50	50	25	WEIGHT TONS				102	
								SPEED FPM				100	100
								H.P				60	
175	20	3½	60	30	50			WEIGHT TONS					
								SPEED FPM					
								H.P					
200	20	3	60	30	50			WEIGHT TONS					
								SPEED FPM					
								H.P					

8. Table IV. Speeds and horsepowers of motors.

NOTE :

Speeds given in the tables are based on the assumption that the driving motor is running at 750 r.p.m. Speeds below and above can be obtained by selecting alternative motors at 600 and 1000 r.p.m. ; the motor horse power is changed in relation to the speed, but the frame size of the machine remains constant. This arrangement gives three speed ranges for each set of gearing.

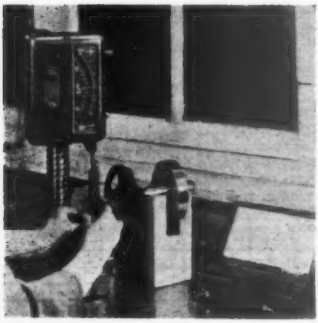
Speeds have been selected on the basis that the crane would be driven by an alternating current motor on a frequency of 50 cycles. The slip speed of an A.C. motor is less than the synchronous speed, so that in practice the actual speeds obtained in service on A.C. cranes will be between 5 per cent. and 10 per cent. less than the figures given in the table.

If a crane is required on direct current supply with working speeds approximately corresponding to those of an A.C. crane, it is permissible to use a motor with correspondingly smaller horse power at 600 r.p.m. Alternatively, if a 750 r.p.m. D.C. motor is used, then a D.C. crane will work faster than an equivalent A.C.

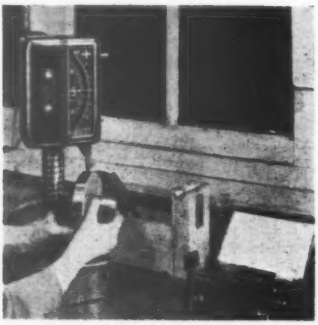
the development of the electrical resistance strain gauges a new field is opened up for stress investigation.

BRAKES

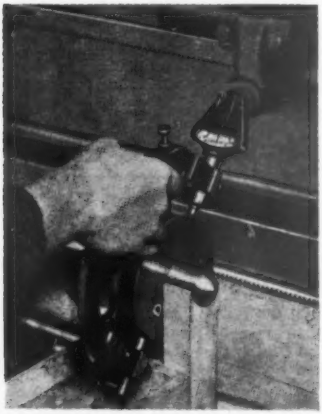
Let us be quite frank and admit that as yet there is no mechanical crane brake which entirely fulfils the crane-maker's requirements. The so-called automatic mechanical brakes are a nuisance. The automatic solenoid brake, especially now that we can fit direct current operating coils supplied from a metal rectifier,



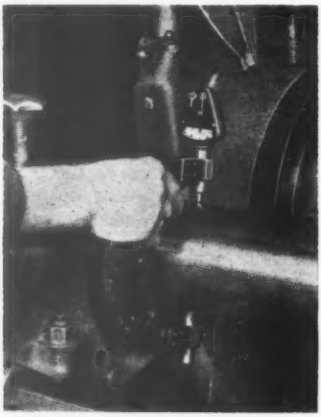
STAGE 1.—The comparator is zeroed to a "Master" gauge block.



STAGE 2.—The "Standard" is compared with the "Master" gauge block.



STAGE 3.—The operator checks that his portable comparator zeros correctly with the standard.



STAGE 4.—The work is checked to the comparator.

9. Method of measuring.

functions well but it gives no variable degree of retardation and therefore can only be a holding brake. Hydraulic transmission for manual operation of brakes is a step in the right direction. From a manufacturing angle all types of drum brakes are a nuisance, as they require hand fitting for assembly. The author is of the opinion that the disc brake mounted on the end of the motor shaft will stage a "comeback."

The eddy current drag coupling which has been recently reintroduced perhaps gives the nearest approach to the ideal brake for

controlling a load. It may be of interest to know that the Company with which the author is connected tried out eddy drag couplings between 1900 and 1905. They were never introduced into crane service so presumably they were a failure, possibly because it was before the use of ball bearings in crane work and the air gaps needed for plain bearings were too great. Two of these couplings were converted into magnetic clutches arranged to clutch in a cone lathe pulley mounted directly on to the line shafting. These clutches remained in service up to 1945 when the lathes they served were scrapped.

WIRING Wiring up cable runs is a crane-maker's headache ; no more wiring is done per man-hour today than twenty years ago so that on a small crane the cost of wiring is often more than the whole cost of the remainder of the assembly. For large cables troughing is replacing conduit and on some cranes controllers and contactor panels have been combined which cuts down the cost of external wiring; on one series of cranes we have run this to the extent of push button contactor control to replace drum control, this saving in external wiring almost off-setting the extra cost of the contactors.

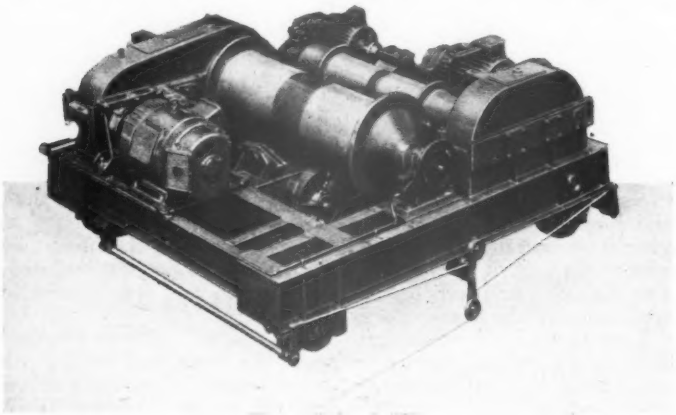
Collector wires are an expensive item but their day is limited ; contactless cable drums are being developed, the latest being a drum that does not need a tension spring. These drums eliminate sliding contacts, give complete insulation from a maintenance and safety point of view, and allow full access to the crab. When they are developed to the extent of being a production job they will be cheaper than collector wires, and a very welcome improvement all round.

LONG TRAVEL MOTION This is a part of a crane which is receiving very thorough examination. The normal long travel drive is expensive, especially the protection of and access to the long travel shaft. The final drive is still open gearing. The need for the shaft fixes the position of the platforms in relation to the end carriages. So far efforts made to enclose the final drive, maintain oil tightness and access for maintenance, have resulted in designs which are even more expensive. The time has come to do away with the long travel shaft and have an individual motor drive at each end. Contrary to general opinion there is no difficulty in synchronising the long travel motors—in fact, it does not matter if they are not synchronised. The difficulty is to synchronise the braking, and with hydraulic application of the brakes this is now possible.

I would say a few words here on this " bogey " of cross-winding. Cranes with driving runners of equal diameters and having the wheel boxes correctly aligned do not cross-wind. If you come across cross-winding troubles do not blame the design ; look for flange binding, check tread diameters and the alignment of the axles. The trouble is sure to be due to one of these causes.

ERECTION Crane users do not seem to realise how much they can influence the cost of erection on site. Lifting beams should always be provided in the roof trusses. To quote two recent examples—both on difficult sites—in the first case a lifting beam was provided and the erection cost £15 per ton. In the other case the crane-maker had to provide tackle and the cost, even spreading the tackle over seven cranes was £25 per ton. As the cranes weighed in the neighbourhood of 90 tons each, the cost of stiffening up trusses would have been amply justified, apart from the time saved in getting the cranes erected.

THE HUMAN FACTOR If we want to get the best production from our factories we have got to give careful consideration to the human factor. To get maximum production an incentive of some sort is needed, and in the past when there was a surplus of labour the incentive was fear of the loss of employment. The high man-hour outputs in America are obtained by wage incentives to buy luxuries of life, or what we think are luxuries. In this country a wage incentive does not have quite the same attraction. Luxuries are in short supply or rationed. Deduction of income tax at source tends to kill wage incentives. It does not follow that because of this the crane-maker in this country is at a disadvantage with the crane-maker of the U.S.A. Crane-making is an engrossing job and many engaged in the industry do not work just for what they can get out of it, but for the interest obtained and for the satisfaction



10. An up-to-date totally enclosed unit construction crab.

derived from putting something into the job. One does not get this type of workman by paying wages at the lowest rates ; this type of man must have a wage sufficient to ensure that money is not a worry to him. Emphasis is laid on the foregoing remarks, because in bringing our factories up to maximum efficiency we must remember that under present-day conditions this will only be achieved if we lay our work out in such a manner that interest is maintained. There is a type of workman who wants a job which he can learn to do automatically and without mental effort, and this is the type of man to select for the high output machine tools. The whole object of present-day production should be to get a man-hour output of such magnitude that the wages bill only bears a small relation to the total cost of production. Once this state of affairs has been reached, no employer will begrudge high rates of pay.

LOOKING AHEAD In what direction does future development of overhead crane design lie?

In the first place the need for batch production in order to keep manufacturing costs down is going to lead to a series of standard cranes to meet given duty factors.

In the interim period before the development of rectifiers, with grid voltage control, if it is even reached, the author hopes that magnetic contactors will entirely replace drum control gear. Sliding contacts for crab collectors are going out. Totally enclosed long travel drives are coming with individual motor drives. Roller bearings are here and will be universally adopted even for the long travel and crab runners, while the disc brake may supersede the drum brake.

It is difficult to forecast whether A.C. or D.C. will be the ultimate type of power supply for overhead cranes. Cranes are going to be lighter in overall weight, but the designs in general will be much better as engineering jobs and this reduction in weight will go hand in hand with an improved performance.

Will development on the lines indicated bring for the user the only result which is of interest to him, better cranes at less cost? The answer is " yes " providing the necessary co-operation is forthcoming from all parties concerned. The crane-makers must not fail to make cranes that will stand up to a given service factor.

Statutory regulations and standard specifications must be amended to the extent that different service factors involving degrees of maximum stress and loading are recognised. The New South Wales Scaffolding and Lift Act already does this.

Suppliers of materials must be prepared to give bigger reductions in price for quantities " off." Users must be prepared to buy standard cranes. This is not likely to be difficult to achieve if the

other factors can be established ; the difference in price between a standard and a special will do all the talking necessary.

In conclusion, do not think for one minute that it is suggested that all crane-makers should build a standard type of crane—this would stifle new development. What I hope I have made a case for is the adoption of the practice of building cranes to suit a specific range of service factors.

REPORT OF THE MEETING OF COUNCIL

26th April, 1951

Council held its fourth and last meeting of the present Institution year on Thursday, 26th April, 1951, at 36, Portman Square, London, W.1. Mr. Walter Puckey, Chairman of Council, presided, and 26 Council Members were present. The Chairman of the Manchester Graduate Section was also present by invitation.

FINANCE On the whole the financial position of the Institution was very much improved, and a surplus of Income over Expenditure was confidently expected at the end of the financial year. The subscription income was fully up to expectation and reflected the loyal support of members.

On the expenditure side all items were within the budget, except printing and stationery. This was due to the greatly increased cost of paper and also because the Institution had recently become liable for the payment of Purchase Tax on certain printed matter.

STAFF PENSIONS SCHEME It was agreed to accept the recommendation by the F. & G.P. Committee that a pension scheme should be introduced for senior members of Head Office Staff, with a proviso that the scheme might eventually be extended to other staff.

ELECTION TO HON. MEMBERSHIP It was unanimously agreed that Mr. J. A. Hannay, a founder member of the Institution, be elected an Honorary Member in recognition of his outstanding services to the Institution over a period of many years.

WESTERN GRADUATE SECTION Council approved the formation of a Western Graduate Section, and the Chairman congratulated the Western Section on their progress.

DERBY SECTION The Chairman expressed the satisfaction of Council that the Derby Sub-Section had grown to such an extent that it could now be granted full Section status.

HARROGATE CONFERENCE, 28th JUNE/1st JULY, 1951 The Chairman called on all Section Presidents to ensure that the Harrogate Conference was well supported by their members. Distinguished speakers had been invited and a first-class programme arranged. Section Presidents were asked particularly to encourage the firms in their Sections to provide facilities for younger members to attend the Conference.

MEMBERSHIP Mr. E. P. Edwards, Chairman of the Membership Committee, drew attention to the article on " Membership Qualifications " which appeared in the March issue of the Journal, and said that this should prove helpful to Section Committees.

A question was raised as to whether an Associate, through a change in his appointment, might become eligible for corporate membership of the Institution. It was pointed out that an Associate could be elected to full Membership if his position in industry made him actually responsible for production.

Council elected 125 members in the following grades :

Members	12
Associate Members	32
Associates	2
Graduates	23
Students	56
	125

(The full list of Council elections and transfers appears on pages 314/316.)

JOURNAL Mr. William Core, presenting the report of the Technical and Publications Committee in the absence abroad of the Chairman, Mr. A. L. Stuchbery, said that the Committees of all Sections and Sub-Sections had been invited to make suggestions for the improvement of the Journal. There had been a good response, and when an analysis had been prepared, the Committee would give careful consideration to the suggestions and criticisms made.

The main difficulty lay in obtaining an adequate supply of prepared papers, and here the Committee was largely dependent on Section Committees, who were urged to help as much as possible in this respect.

YEAR BOOK The question of producing an Institution Year Book had been thoroughly investigated, but owing to the high cost to the Institution it had been decided to defer the project for the time being.

HAZLETON MEMORIAL LIBRARY The postal lending and information services were in great demand and many members had expressed appreciation of assistance received in this way. The Library now contains over 1,800 volumes, in addition to approximately 90 technical periodicals. A record was being maintained of requests for books which the Library was unable to meet, as a guide to future purchases.

RESEARCH Mr. B. H. Dyson, deputising for the Chairman of the Research Committee, Sir Lionel Kearns, reported that the Work Measurement Research Unit of the University of Birmingham had completed the national survey and were preparing the final report. The reports on Time Study Training and on Machine Utilisation (the latter being largely the work of the I.C.W.A.) were in draft form and would be published very shortly.

MATERIALS HANDLING Although the Sub-Committee had not been able to arrange a meeting during the quarter, Mr. Dyson emphasised that a great deal of work had been done, particularly in conjunction with the Education Committee, who had approved a syllabus submitted by the Sub-Committee. Arrangements were being made for ad hoc courses in the Principles of Materials Handling to be held in three or four selected colleges during 1951/52. It had also been agreed to increase the Material Handling content of parts of the Associate Membership Examination syllabus.

The Sub-Committee were also drawing up a " check list " for use in industry.

STANDARDISATION Mr. R. K. Allan, deputising for the Chairman of the Standards Committee, Mr. J. E. Baty, said it was the feeling of the Committee that much valuable work could be done if Sections could arrange discussions on the subject of standardisation and simplification and promulgate the idea that standardisation represented great economies when properly employed.

SCHOFIELD TRAVEL SCHOLARSHIPS Mr. B. H. Dyson, Chairman of the Awards Sub-Committee, said that although the number of applications for 1951 had been less than in the previous year, the average level was higher. It was agreed by Council that the Scholarship Scheme be extended to members outside the U.K., and that the overseas Sub-Councils in rotation should send one scholar each year to Great Britain.

ASSOCIATE MEMBERSHIP EXAMINATION —EXEMPTIONS Mr. W. E. Park, Chairman of the Education Committee, drew attention to the very important concession made in the twelve months following September, 1950, to meet the case of young men who had satisfied to a very large extent the requirements existing before that date, and would probably have completed doing so by the end of the 1950 technical college session or early in 1951. This should meet the desire to encourage young men to proceed to obtain the qualifications of the Institution.

EDUCATIONAL ACTIVITIES The growth of courses was satisfactory, but there was need for the dissemination of more information on the wide scope of production engineering. In many places production engineering was still considered on too narrow a basis.

OBITUARY The Chairman reported, with deep regret, the deaths of the following members: Mr. J. Duncan Adie, Mr. J. Erskine, Mr. F. Glover, and Mr. C. Reay. He referred particularly to Mr. Glover who had been a member of the Australian Sub-Council and who had addressed Council during a visit to the United Kingdom in 1947.

DATE AND PLACE OF NEXT MEETING Thursday, 26th July, 1951, at 36, Portman Square, London, W.1, at 11 a.m.

ELECTION OF MEMBERS The following were elected to Membership by Council :—

As Members :

S. Brock, J. R. Brown, H. Bull, G. C. Castell, L. R. Chandler, S. R. Clegg, R. C. Cross, W. C. Essex-Clark, J. E. I. Gaymer, Lt.-Col. H. G. Good, N. C. van B. van der Grijp, R. F. Hanks, C. G. Robinson, F. R. Shaw, A. N. D. Tate, L. W. Thackwell, F. Wain, G. W. Williamson.

As Associate Members :

J. L. Adcock, F. A. Arnell, L. W. Bailey, J. W. Baker, A. S. Beedham, P. S. Bhogal, W. H. Birch, A. E. Blackmore, F. E. Braisby, C. T. Butler, A. Chambers, R. Charles, F. R. W. Charlton, H. R. Cook, H. E. Cope, A. V. Day, M. C. Dempsey, P. R. O. Diggon, W. T. Ellis, J. H. N. Finer, M. N. Fox, J. G. Gibson, C. G. Green, L. B. Green, W. E. Guppy, C. K. Haldar, J. E. E. Hillier, B. E. Hood, J. Hunter, G. Jackson, A. Jennings, C. A. Johnston, W. J. Kenyon, A. L. Lacey, R. C. C. Martin, C. E. May, S. G. Meadows, L. P. Molnar, A. T. Morrison, H. R. Muir, G. M. Otway, A. E. Pearce, H. L. Puri, G. Rayment, H. J. Riseley, F. J. Rouse, G. Russell, A. B. Stubbs, A. K. Thomas, S. E. Townsend, C. F. P. Waller, E. G. C. Warr, G. E. Wilkinson, A. G. Wingate.

As Associates :

A. Chempin, A. F. R. Fletcher, E. C. Peckham, G. D. Phillips, H. N. Sitharamiah.

As Graduates :

P. Amm, R. D. Ashton, J. C. Atkins, E. W. Best, D. A. Bloom, B. D. Collins, H. G. Eales, A. Emmerton, A. C. S. Ensell, L. W. Fincham, M. L. Freeman, J. W. D. Gibson, K. A. G. Giles, D. S. Gwynne, B. L. Harsant, J. R. Hawkins, W. J. Hobbs, A. M. Hounam, D. K. Keene, H. G. Lamb, W. M. Lambert, P. G. McGlynn, H. Newson, A. W. Nixon, G. W. Pratt, D. H. Ranford, S. C. Ray, O. F. Rendell, F. Renwick, R. Rudolph, P. W. Rowland, J. E. Sedgwick, J. B. Sell, R. A. Shrubsole, J. W. Stevens, F. F. Storey, N. E. Stott, D. R. H. Webster, J. W. C. Whenmouth, D. D. Willett, W. S. Worrall.

As Students :

J. E. Adkins, R. J. Aldhous, A. Arthur, I. L. Bateman, H. Batty, H. S. Begley, S. G. Bennett, S. K. Biswas, D. G. L. Bowden, L. T. Boyle, W. Burnett, W. Calderbank, I. C. Campsie, J. K. Carpenter, P. J. Cashmore, M. C. Clinch, D. W. Cockayne, W. C. Dawson, K. W. Daykin, E. J. Edwards, W. J. Evans, K. C. Gamston, B. H. Garrett, A. B. Gibson, S. C. Goodman, D. Goold, C. Hann, J. E. Heape, S. E. Heath, T. L. Henthorne, B. T. Hill, J. N. Hullah, M. J. Inston, P. S. Keedwell, J. F. Leonard, K. W. Lockley, R. W. Martin, D. A. Morrison, B. McCloskey, R. W. McCulloch, C. A. McLoughlin, T. A. Newbould, B. Niyogi, J. P. Noble, F. J. Pellow, R. E. Plaster, D. R. Poole, T. Proctor, J. E. Rice, J. K. Robinson, D. G. Rose, F. A. Sanders, A. C. Sharp, S. R. A. Sheldon, M. Smith, H. P. Stern, A. R. Stoddart, G. Sugden, R. Tanner, K. Todd, R. F. Wade, M. A. Wahhab, J. A. Wall, A. H. J. Watts, J. B. Watts, J. D. Webber, L. G. Wheal-Weaver, R. C. Williams, R. H. Williams, H. E. Willis.

Affiliated Firms :	Change of Affiliate Representatives :
A. Reyrolle & Co., Ltd.	R. B. Neary, J. H. Gibson, T. Williams.
F. E. Rowland & Co., Ltd. ..	H. J. Woodward.
S. Russell & Sons, Ltd.	J. O. Hughes.
The British Oxygen Co., Ltd. ..	M. Seaman.

New Affiliated Firm :	Affiliate Representatives :
Rolls Royce, Ltd.	A. G. Clark. A. Short.

Reinstatement as Member :

The Rt. Hon. Lord Auckland.

Reinstatement as Associate Member :

E. R. Unwin.

Transfers :

From Associate Member to Member :

J. Ayres, E. Barrs, J. W. Browne, H. Crompton, A. W. Hill, A. R. Lewis, J. Lowther, J. Lund, W. J. Marshall, J. C. Sharman, M. P. J. Smith, A. Wakeman, N. W. Walton.

From Intermediate Associate Member to Associate Member :

K. S. Ayapa, R. D. Barlow, J. Crabb, W. J. Cumberland, H. H. Ghosal, G. T. W. Hall, F. Hampson, J. Jones, G. R. Lightford, E. T. Pearce, A. L. Reed, B. W. Rogers, G. W. Rogers, C. J. Thresh, S. Upton, G. E. Warner.

FROM ASSOCIATE TO ASSOCIATE MEMBER :

D. W. Howe, W. G. A. Jenkins.

FROM GRADUATE TO MEMBER :

S. Radcliffe, C. A. E. Vince.

FROM GRADUATE TO ASSOCIATE MEMBER :

C. S. Askham, M. F. Avery, G. W. Ayres, C. H. Bayliss, W. A. Clennell, R. H. Cubitt, H. A. J. Edlin, L. Fraser, E. Garside, H. P. Jost, V. Lee-Brown, J. Quin, B. G. J. Robinson, J. Rothwell, A. H. Shipley, S. G. Spate, P. J. Stevens, R. Tilsley, E. A. Wootton.

FROM GRADUATE TO ASSOCIATE :

V. D. Farrants, B. L. J. Hart.

FROM STUDENT TO ASSOCIATE MEMBER :

F. Pickup.

FROM STUDENT TO GRADUATE :

D. W. Birchmore, D. A. Chapman, A. Dancer, J. A. De Courcy, R. H. B. Dipple, W. F. Hilton, F. Hooson, J. Irwin, W. G. Peters, A. L. Rutherford, T. J. Sullivan, R. J. Temple, L. F. W. Wootton.

LOCAL SECTION REPORTS

Adelaide

A Section Committee meeting was held in February under the Chairmanship of Mr. W. Gwinnett, and carried out routine business. Also, a tentative syllabus for 1951 was drawn up.

The General Meeting was held on the 28th February, when a lecture was presented by Brigadier A. Sewell, O.B.E., Managing Director of Tecalemit Pty. Ltd., on " Production from a Salesman's Point of View." Members and guests of the audience, which consisted of approximately 70 people, participated keenly in the discussion.

Bombay

Two meetings of the Bombay Section have been held during this quarter. At the January meeting a most interesting paper entitled " Machine Tools—The Basis of Industry " was read by the Section President, Mr. C. Warren-Boulton, M.I.Prod.E., and was received with great interest by those present. In February the Section had the opportunity of hearing a talk and witnessing a technical film show entitled " The Age of Precision " given by Mr. H. Bramwell, A.M.I.Prod.E.

Attendance at recent Section meetings shows a gratifying improvement and steps have been taken to increase the interest value of Bombay meetings.

Applications for membership are still being received at a very satisfactory rate, though it has been necessary to hold these in

abeyance, to some extent, until complete clarification of the position in India resulting from the inauguration of the Institution Associate Membership Examinations. The Bombay Section is very gratified to observe that it still leads the Institution on percentage membership increases since the 1st November, 1949, and all members of the Section are co-operating in putting forward the best possible efforts to ensure that this state of affairs shall continue.

The Working Group formed to report on " Materials Handling " has been somewhat hampered in its efforts by the absence on business tours of its members, but it is believed that satisfactory reports in this direction can be shown in the not too distant future.

Calcutta

The Calcutta Section have held one or two interesting meetings; in January, a film entitled " The Wimet Age " was shown, and the Section was fortunate in having Mr. L. K. Lord of A. C. Wickman Ltd. to answer questions. The meeting was well attended. On 8th February, a paper entitled " The Manufacture of Tea Machinery in India " was read by Mr. K. C. Mitter A.M.I.Prod.E. On 15th February, a visit was arranged to see over the Rifle Factory, Ishapore. This was most interesting and fully appreciated by those who took the opportunity offered. The meeting of 7th March, unfortunately, had to be cancelled, as the paper was not ready, and it was decided to hold this later. Further meetings for April and May were arranged.

Applications continue to be received and monthly Membership Sub-Committee meetings have been held. Arrangements for the Institution Associate Membership Examination are being completed and candidates have been notified. Centres will be in Calcutta and Delhi.

A full Committee meeting was held in February, when the Section were fortunate in having a visit from Mr. C. Warren-Boulton, M.I.Prod.E., President of the Bombay Section, and the two Sections' Presidents put forward some very useful suggestions.

Coventry

In the last quarter, the Coventry Section has had some very interesting lectures which were very well attended, with an average of 100 people per lecture.

The lecture by Mr. W. Aspinall, the 1950 Schofield Scholarship winner, was very good indeed. Mr. Aspinall gave an excellent lecture, not only on welding, but also on the American way of life and social conditions. The meeting was attended by Major-General K. C. Appleyard, C.B.E., Dr. H. Schofield, C.B.E., Mr. E. W.

Hancock, M.B.E., Mr. B. H. Dyson, and Mr. W. F. S. Woodford, Institution Secretary ; with Mr. B. C. Harrison, President of the Coventry Section, as Chairman.

The Section Annual Dinner Dance was held at the Daimler Ballroom, and was a most successful evening. Approximately 400 members and friends attended.

Dundee

During the interval since the submission of the last report, the Dundee Section Committee has held regular monthly meetings and all business is up-to-date. Several applications for membership were received and passed to Headquarters. Other applications are at present awaiting consideration by the Committee.

Contact has been made with both the Halifax and North Eastern Sections regarding the Harrogate Conference, and details of the contribution expected from the Dundee Section are now being worked out.

One further Section meeting was scheduled for 10th April, to complete the session and arrangements are in hand for the Annual General Meeting.

Eastern Counties

(a) *Local Activities*

Lecture meetings were held during January, February and March. The January lecture on " Product Packaging " by Mr. John Evan Cook, attracted many visitors from local industries. Mr. Hooker's lecture in February on " The Measurement of Productivity " was held jointly with the Institute of Cost and Works Accountants. The March lecture given by Dr. W. A. Tuplin on " Noise and Vibration in Machinery " approached this subject in scientific fashion and created an interesting discussion.

At the Annual General Meeting, Mr. A. H. Leggett was elected President, and Mr. E. N. Farrar, Vice-President. The new Section President is a Director of E. R. & F. Turner Ltd., Foxhall Works, Ipswich.

(b) *Working Groups*

The Working Party on " Materials Handling " has held its first meeting under the Chairmanship of Mr. K. M. Standwell of Ransomes & Rapier Ltd., Ipswich. A good response has been received to a circular letter sent to local industrial concerns, and a questionnaire is being prepared. The Working Party is representative of the major firms in this district.

(c) *Technical Papers*

A copy of Mr. John Evan Cook's paper on " Product Packaging " was submitted to Head Office. The Committee were pleased to note that the paper on " Photoelastic Stress Analysis," given by a local metallurgist, Mr. S. Widdas, was published in the January issue of the Institution's Journal.

(d) *Membership Growth*

In order to provide better facilities for meetings for members in the Norwich area, and to expand on membership, it is hoped to form a Sub-Section in Norwich. An exploratory meeting has been arranged for 12th October, 1951, and it is proposed to invite a prominent speaker to address the meeting.

Edinburgh

The lecture programme has now concluded. Attendance varied from 17 to 120, the latter being at a joint meeting with the Institute of Personnel Management. A complete programme of works visits has been arranged, covering a diversity of industrial activities in and around Edinburgh, and the Committee are sure that members will find them to be of the greatest interest.

The Annual General Meeting of the Section was held on 24th March, 1951, when the Committee elections were held, and a new Section President and Section Honorary Secretary were elected.

The Committee is busily engaged in arranging a series of lectures for the 1951/52 session, and the subjects selected are such that they should have maximum appeal to members.

Glasgow

In January, Mr. P. Spear, Grad.I.Prod.E., gave a good lecture to the Section entitled " Fine Finishes by Machining Techniques."

An open discussion night was held on 1st February, and Mr. W. P. Kirkwood gave a short paper on " Human Relations in Industry." A lively discussion on this subject followed the paper. On 15th February, Lieut. Colonel L. Urwick, O.B.E., read a paper on " Education for Management." This was a joint meeting with the I.W.M. and the I.C.W.A., and was well attended by 180 people.

On 1st March the Annual General Meeting was held, which was followed by an open discussion on two short papers given by Graduate members. On 15th March, Mr. G. W. Trobridge, B.Sc., gave a paper on the " Use of Rubber as an Engineering Material."

Leicester

During the last quarter, the Section has held four lecture meetings covering a wide variety of subjects. The best attendance was

recorded at the Annual General Meeting, which proved so absorbing that the discussion under " Any Other Business " had to be curtailed to permit the showing of a most interesting film on the " Hydroptic Jig Boring Machine."

In its Annual Report, the Committee was able to show an increase of thirteen in the Section membership, bringing the total to 190. This growth was remarked upon by Mr. N. A. Cullin in his Presidential Address. When he was the first Leicester Honorary Secretary, and the Section was founded in 1934, the membership was 12, and, as another speaker commented, both Derby and Nottingham have been shed from the Leicester Section area in the meantime.

The Committee, which has met regularly throughout the quarter has made arrangements for the Section Annual Dinner to be held on 18th April. This was a most popular pre-war event and on this occasion, Mr. H. L. Satchell, M.B.E., was the Section's Guest of Honour. (Photograph on page 269.)

The Works Visits to be held this summer will include one to Peterborough and this will bring Section activities closer to those members of the Section who dwell in that area. The morning's visit to local works will be followed in the afternoon by a lecture meeting, and it is hoped in this way to compensate parts of the rather widespread Section area.

The Section prize—the Rollings Prize for the best paper by a Student or Graduate—is now open to competition again, and notice of intention to compete, or enquiries, should be directed to the Section Honorary Secretary.

Lincoln

(a) *Section Activities*

Since the last Quarterly Report was submitted two meetings have been held ; the first in January was a lecture by Mr. C. Willcox on " The Use of Air in Industry." This lecture, which was admirably presented, was also well attended, a total of 70 members and visitors being present. The February meeting took the form of a Works Visit to Clayton-Dewandre, Lincoln, at which 53 members from Lincoln and district were present. On the subject of meetings generally, very considerable improvement in attendance has been noted this Session, and this applies particularly to members in outlying districts of Lincoln, whose attendance is now much above average. The Annual General Meeting was arranged for 3rd April. The Education Officer, Mr. T. B. Worth, had agreed to attend and address the meeting.

(b) *Working Groups*

Up to the present the Committee have not been able to form any

working groups, due to the difficulty of finding a suitably qualified Chairman, but an endeavour is being made to start a working group during the winter Session.

(c) *Membership Campaign.*

Since the last report, three non-Corporate members have been transferred to Corporate membership and one Student has been elected.

Regarding future activities, the Committee are endeavouring to bring the Institution to the wider notice of concerns in this area, and to this end have arranged for two meetings to be held in the Scunthorpe area, one during the coming summer and one during the winter Session.

(d) *Harrogate Conference*

The President has circulated all members of the Committee, pointing out that he considers it of the utmost importance that the Section should be represented at the Conference and has suggested that Committee members should either make arrangements to attend themselves or arrange for junior members from their own companies to be present. The President points out that junior members would derive great benefit by thus taking a more active part in the working of the Institution.

Liverpool

(a) *Membership*

The total membership of the Section is now 178 with six further applications before the Section Membership Committee.

(b) *Sub-Committees*

Sub-Committees dealing with Education, Standardisation, Research and Publications have all had their Inaugural Meetings. Secretaries have been appointed for each Committee and " terms of reference " discussed.

(c) *Lectures*

During the Quarter, the Section has had the following papers read: " Applications of Mechanised Systems to Production," by Mr. R. Bailey, and " Measurement of Productivity," by Mr. Walter C. Puckey. This paper was given to a joint meeting of the local branches of the Institution of Works Managers, the Institute of Cost & Works Accountants and the Institution of Production Engineers.

(d) *Schofield Travel Scholarship*

It is with pleasure that the Section learned that Mr. Walton, the

Liverpool Graduate Section Chairman, had won this scholarship and will be shortly sailing to America.

London

During the first quarter of 1951 the work of the London Section has progressed smoothly. Practically the whole of the activity has been in the holding of lecture meetings, which now amount to a considerable number with three Sub-Sections holding their meetings in their own localities. The main London Section has had well attended meetings. On 18th January, Dr. P. M. Macnair gave a talk on " Sheet and Steel Plate Manufacture " which was illustrated by a long and interesting film showing the complete process of steel making. On 15th February, " Building An Ocean Liner " was the subject of a talk by Mr. J. S. Redshaw, O.B.E., M.I.N.A., Chief Naval Architect of Vickers-Armstrongs Ltd.

Following the practice recently started of holding main London Section meetings away from the centre of the city, a second meeting was held at Croydon, when Mr. F. G. S. English gave a paper " A Broader Conception of Productivity and its Measurement." This paper was well received and provoked considerable discussion, especially in view of the fact that the large audience included a number of members of the Institute of Cost and Works Accountants.

The Committee has lost the valuable services of Mr. H. W. Townsend, who has left London to take up an appointment in the Glasgow area, and Mr. F. G. S. English has been co-opted to fill this vacancy for the remainder of the year 1950/51.

This Section is doing its utmost to ensure that it is adequately represented at the Harrogate Conference at the end of June, but it is a little early to judge the final result of attendance of London members. However, members are being urged to do their best to take part in this Conference.

Membership continues to grow steadily, but while the intake is substantial, its size and importance is diminished if it is regarded as a percentage of existing membership.

The first social event of the London Section to be held since the war was a highly successful Dinner on 1st February. A brief report of this function appeared in the April issue of the Journal.

Reading

The lectures which have been held during this Quarter have been exceedingly well attended, considering the displacement of members, and some interesting correspondence has ensued from visitors at the meetings, with enquiries about joining the Institution.

The programme for next session is under way, and the Committee

is trying to make it as varied as possible, taking into consideration the suggestions of members.

Membership is increasing, and it is hoped that members will further the cause of the Institution by bringing colleagues along to the meetings so as to foster their interest.

South Essex

Three papers have been given to this Sub-Section during the quarter and in view of the travelling difficulties in the area the meetings were held in different places. In January, Mr. H. J. Marsh, of the Industrial Welfare Society, gave a paper on " Personal Matters in Industry," while in February, Mr. W. J. Dimmock gave a paper on " Materials Handling." In March a paper on " Budgetary Control " was given by Mr. Frankland. All these meetings were well attended in view of the fact that it seems inevitable that audiences must be drawn from a very small radius round the meeting place.

Luton Graduate

(a) *Local Activities*

Early in February a pleasant afternoon was spent by members of the Section on a visit to the new premises of the Lapointe Machine Tool Co., Otterspool. A film illustrating the work of the National Physical Laboratory was shown later in the month, followed by a Saturday visit in March to the Laboratories at Teddington. The combined Annual General Meeting and Graduates' Evening, held in March, proved to be very successful. After the election of Officers for 1951/52 Session, papers were read by six Graduates in competition for the President's Prize awarded by the main Committee. First prize was gained by Mr. P. V. Brown, and second prize was gained by Mr. J. B. Wilcox. A very high standard was attained, and judging was carried out by a panel from the main Committee. At the February Committee Meeting, a Sub-Committee was formed to arrange the 1951/52 programme.

(b) *Research Working Group*

A Working Party to study " Materials Handling with special reference to the Disposal of Swarf and Scrap " was inaugurated in January.

(c) *Membership Growth*

During the past year Section membership has increased by 20 above the previous year.

Manchester

(a) *Local Activities*

In December a lecture entitled " Fundamentals of Production Management " was given by Mr. M. Seaman. This paper exhibited a perspective rarely appreciated by the man on the job. Mr. E. E. Storm gave an extemporary talk on " Jet Engines," in January, illustrating his subject with numerous samples of components and photographs. The discussion which followed was interesting. In February, Mr. F. T. Dean gave an excellent paper entitled " Mechanical Handling with special reference to Textile Industry." Visitors had been invited from various local bodies, such as the Shirley Institute and the Manchester Chamber of Commerce, and the discussion which followed was, in consequence, spontaneous, vigorous and instructive. The Section Honorary Secretary took the opportunity of raising the question of forming a working group to study aspects of this subject locally, and there has been response to this, partially from potential future members.

On the 19th March the Annual General Meeting was followed by a lecture on " Foremanship," by A. P. Young, Esq. This was extremely well delivered and the subject presented from a most unexpected aspect the pressing necessity for an expansion of Christian principles which would ensure good relations and agreed unilateral objects of purpose.

(b) *Stoke-on-Trent Sub-Section*

On the 21st February the Inaugural Meeting of the Stoke-on-Trent Sub-Section was held and was most successful. Thanks are due to Mr. H. Porter of the Manchester Section Committee who has done much hard work in the formation of this Sub-Section to which he has been elected Chairman. Appreciation must also be expressed to the members who have formed the Committee at Stoke, and to Mr. A. Fraser, the Manchester Section President, and Mr. F. W. Cranmer, Vice-President, for their assistance.

(c) *Membership Growth*

The membership growth has continued steadily, although not at quite so great a rate as was formerly anticipated. The Committee are continuing their efforts, and are retaining this subject heading as a standard item on their Agenda.

(d) *Annual General Meeting*

Mr. A. Fraser is, unfortunately, unable to continue as Section President for a second term of office, but has been elected to fill one

of the vacancies on the Committee. It is not yet possible to announce the new Section President.

(e) *Conference at Harrogate*

This is remaining as a standard item on the Agenda.

Stoke-on-Trent

The first Committee Meeting of the Stoke-on-Trent Sub-Section was held in December at Stoke-on-Trent, when Mr. H. Porter acted as Chairman. At a subsequent Committee Meeting held in January, it was agreed to invite Mr. W. Robinson, M.I.W.M., to give a paper at the Inaugural Meeting of the Sub-Section.

The Inaugural Meeting was held on 21st February at the North Staffordshire Technical College, Stoke-on-Trent. Mr. H. Porter presided at this meeting and the Section was pleased that Mr. W. F. S. Woodford, Secretary of the Institution, and Mr. S. Caselton, of Head Office Staff, were able to be present on this important occasion.

Prior to the lecture, Mr. W. F. S. Woodford gave a brief, interesting address on the aims and objects of the Institution, and, subsequently, Mr. W. Robinson presented his paper, "Joint Consultation in Industry," to a very appreciative audience, and this was followed by a very enlightening discussion.

The Annual General Meeting was held on 30th March and was followed by a lecture by Mr. T. B. Worth, the Institution Education Officer, entitled "An Assessment of Production Engineering Training." The Paper was received with very great appreciation.

Manchester Graduate

The programme of lectures and visits for the past Session has been both interesting and educative, and the Section have received many compliments especially from visitors and members of the Senior Section.

The Study Group meetings, about which members received several circulars, were on the whole successful. A report has been sent to Head Office and it is hoped that further information on this matter will be published in the Journal or by circular letter some time during this year.

Melbourne

The activities of the Section have been at a standstill during the past two months due to the summer vacation period. Nevertheless,

the Committee has met on two occasions, holding its first meeting this year on 21st February.

A very interesting and attractive syllabus has been prepared for 1951, and the Section is looking forward to a most successful year.

North Eastern

The February meeting was addressed by Mr. H. Eckersley, his subject being " Practical Application of Tungsten Carbide." This meeting was well attended and much appreciated. An interesting discussion followed.

The Section Annual Dinner was heldon 3rd March. Both Mr. J. E. Hill, Vice-President, and Mr. W. F. S. Woodford, Secretary of the Institution, were present, and this proved to be a very happy occasion.

On 19th March, the Annual General Meeting, followed by a film show, was held.

The Section Committee is, at present, busy preparing the programme for Session 1951/52.

North Eastern Graduate

Two papers were presented by Graduates at the January meeting, " Machine Tool Prime Movers " and " Production Aids on the Horizontal Boring Machine." In February, a paper entitled "Management Control " was presented also by a Graduate. The Section's Annual General Meeting was held in conjunction with the March General Meeting. The lecture given at this meeting was entitled " Work Measurement " and was presented by Mr. W. K. Hall of the Imperial Chemical Industries Ltd., Billingham.

Visits have been conducted to Vickers-Armstrongs Naval Yard, Walker ; Pyrotenax Ltd., Hebburn ; and Victor Products Ltd., Wallsend.

The Section Committee are now arranging the programme for next Session.

Sheffield

The first meeting this year was well attended, when Mr. John Baker gave a provocative paper on the " Design of Electric Overhead Cranes." The paper and the discussion were very informative and were appreciated by all present. An informal discussion meeting held in January was not so successful and a different approach to this type of meeting is to be sought by the Committee. It was unfortunate that Dr. Galloway should be taken ill immediately before he was due to address this Section in February, but Mr. Tilsley, the Research Manager at Melton Mowbray, stepped into the breach and gave an admirable talk on the work of P.E.R.A.

A moderate-sized audience saw three films on " Materials Handling " on 26th February, when Mr. N. A. Jenkinson of the Anglo-American Productivity Team stood by to answer questions. New ground was broken on 7th March when the members of the Sheffield Section were invited to attend a meeting of the Institution of Electrical Engineers to discuss the report of the Anglo-American Productivity Team on " Generation and Distribution of Electricity."

The Annual General Meeting was held on 12th March and was followed by an excellent paper on " The Manufacture of Railway Laminated Springs." This paper was given by Mr. R. Fielding, a member of the Sheffield Section, and gave rise to a good discussion on the mechanisation of an old-established craft.

Sidney

(a) *Local Activities*

During the months of December, January and February, the Section was in recess and no meetings took place other than Committee Meetings. On 6th March, the Section opened the 1951 series of lectures when three papers were presented. Mr. S. E. Barratt, M.I.Prod.E., presented a short paper entitled " Headquarters of the Institution," wherein he enlightened members on the organisation of Head Office at Portman Square. He spoke of the different departments and the part they played in the functioning of the Institution. This talk proved most enlightening, especially to all Committee men. The second paper " Surface Broaching " was presented by Mr. James M. Steer, A.M.I.Prod.E. Mr. Steer, with the help of illustrations, gave an up-to-date review of the latest methods in surface broaching which he witnessed during his recent trip abroad. The final paper of the evening " Carbide Tools " was presented by Mr. Charles E. Jones, M.I.Prod.E., who recently returned from a trip to the United States of America and England. Mr. Jones was able, in a very interesting manner, to tell of the latest developments occurring in both countries on this most interesting subject.

In March a circular was sent to all Section members advising them of local matters of interest concerning the Institution. In future circulars will be sent to members each month.

(b) *Research—Working Groups*

Much discussion has taken place at Committee Meetings on the subject of Working Groups and it is hoped to have two groups in operation in the near future.

(c) *Technical Papers and The Journal*

The letter from London, addressed to the Section President, asking for views on certain points regarding the Journal was discussed

at the last Committee Meeting, and it was proposed that the Papers Sub-Committee study this letter thoroughly and make its recommendations at the next Meeting. A final recommendation from the Sydney Section will then be forwarded to London.

(d) *Membership Growth*

The strength of the membership at present totals 186.

(e) *Education*

It was with much regret that the Committee learned of the resignation of Mr. C. A. Gladman, M.I.Prod.E., as Lecturer-in-Charge of the Certificate and Diploma Courses in Production Engineering at the Sydney Technical College. Mr. Gladman has done much in getting these courses established on a sound footing at the Technical College and his loss will be very much felt.

A number of students are now enrolled in the Certificate Course in Production Engineering and also in the Diploma Course at the Sydney Technical College.

(f) *Standardisation*

The following revised British Standard Specifications are being considered for endorsement as Australian Standards :—

B.S.	328:1950	Twist and Straight Flute Drills.
	870:1950	External Micrometers.
	887:1950	Vernier Calipers.
	1127:1950	Circular Screwing Dies.

(g) *Hazleton Memorial Library*

Donations received from members of the Sydney Section towards the Hazleton Memorial Library amounted to £20 13s. 0d., and this amount has been forwarded to London.

Wolverhampton

During the past Quarter, Committee Meetings have been held each month and much work done in the interest of the Section.

Lectures have been held each month, but the attendance has not been up to the usual standard, partly due to the adverse weather conditions. At the same time the Committee would like to see, and meet, many more members at the lecture meetings.

The Annual General Meeting was held on 7th March, when the Section President, Mr. H. Tomlinson, together with the Vice-President, Mr. R. Beasley, were unanimously re-elected to office for a second year.

Shrewsbury

During the last quarter, two lecture meetings have been held and the subjects offered, namely, " Precision Castings " and " Materials Handling " proved very interesting and encouraged good discussions.

All lectures and Committee Meetings have been well attended.

Wolverhampton Graduate

During January, three meetings were held as the Section's contribution to the Common Subject " Measurement of Productivity." Advance copies of the three papers were all available in printed form prior to the meetings. It was evident from the number of requests for these papers that the subject was of great interest.

The papers were " A General Survey of the Subject," by Mr. N. A. Dudley, " The Reciprate Method of Time Study Analysis," by Mr. D. J. Desmond, and " The Purpose and Nature of Methods Engineering," by Mr. Winston Rodgers.

In January a party of 40 were conducted round the works of the English Electric Company at Stafford. On 13th February a lecture entitled " Electricity in the Factory " was given by Mr. J. S. Brotherton and on 21st February a party of 18 visited the Lockheed Hydraulic Company.

On 15th March a visit was made to the operating theatres, X-ray, photographic and service departments of the Royal Hospital, Wolverhampton and on 22nd March, the Section's Annual General Meeting followed by a lecture " Pressure Die Casting in Zinc Base and Aluminium Alloys " took place. The lecture, illustrated by a film and diagrams, was presented by Mr. A. Munslow.

Six Section members attended the Graduate Conference held at Birmingham on Saturday, 31st March, 1951.

Arrangements are well advanced for the combined meeting of Wolverhampton, Birmingham and Coventry Graduates in London on 26th May, 1951. Included in the meeting will be a visit to the South Bank Exhibition followed by a dinner.

A Working Group for the study of Measurement of Productivity has been established. By arrangements with the Wolverhampton Technical College, the group will have the use of the college buildings and equipment and will operated a planned programme over an initial period of ten evening sessions.

Yorkshire

The Section has held regular lecture meetings during the period under review. These have covered a wide variety of subjects, and proved to be very interesting.

The Annual General Meeting was held on 12th March, when the Section Officers and Committee were elected for the year 1951/52. The Annual Dinner was held on 14th April at the Hotel Metropole, Leeds, and the guests on this occasion included Canon A. S. Reeve, Vicar of Leeds ; Mr. Rodney Butler, President—Engineering and Allied Employers Leeds and District Association ; Colonel C. Banks, M.B.E., M.P. ; Mr. W. F. S. Woodford, Secretary of the Institution ; and the Presidents of the Halifax and Preston Sections, and Presidents of kindred local associations.

The Yorkshire Section have combined with the Halifax and Sheffield Sections and formed a Reception Sub-Committee in connection with the Institution Conference to be held in Harrogate.

The Section membership is steadily increasing and is now 384.

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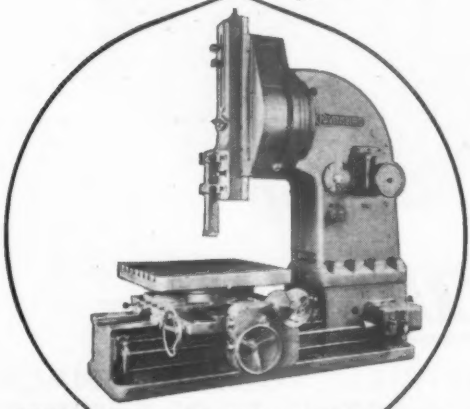

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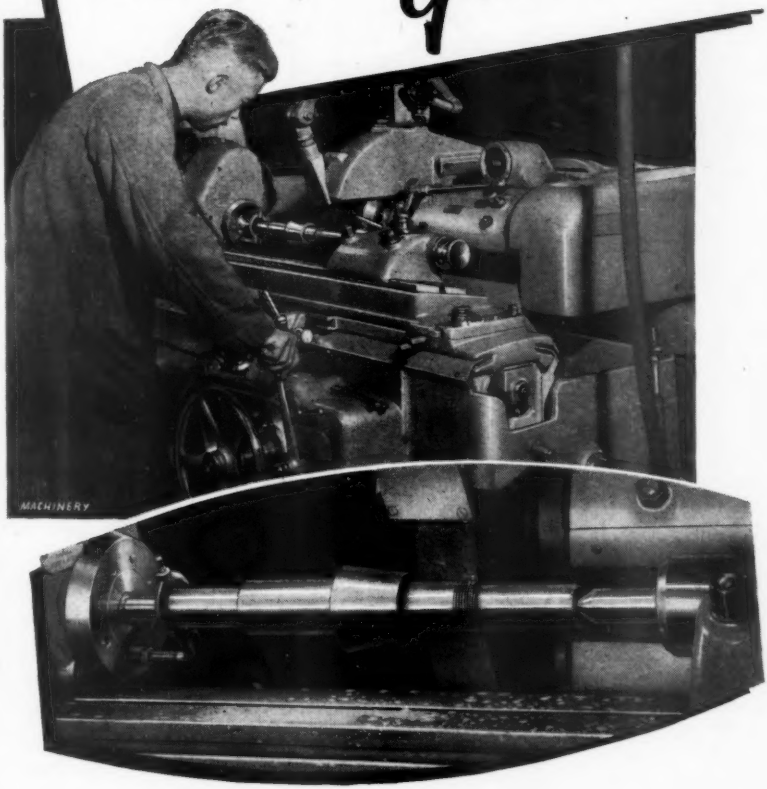

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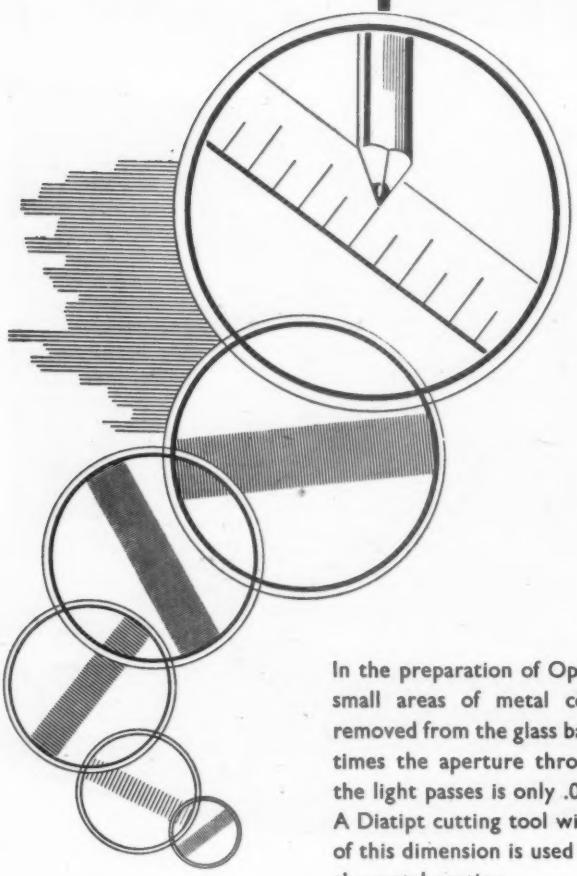

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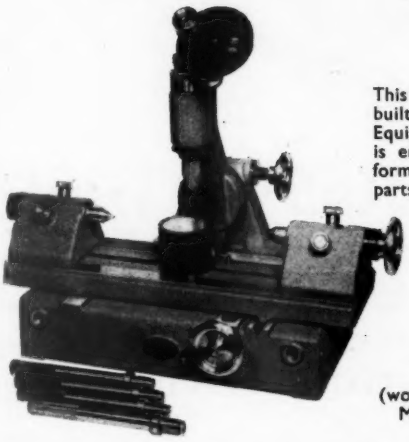

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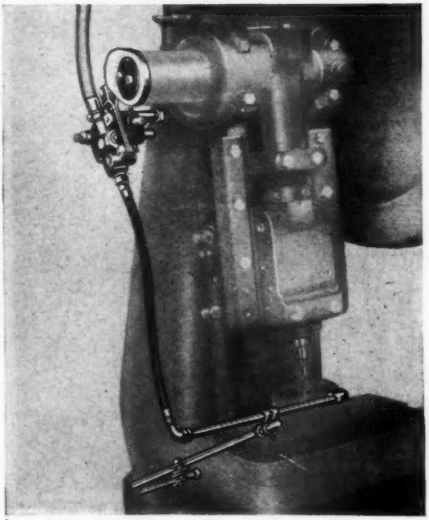

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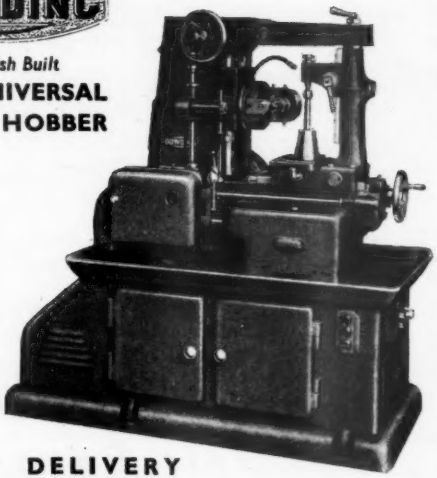

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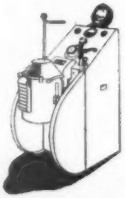

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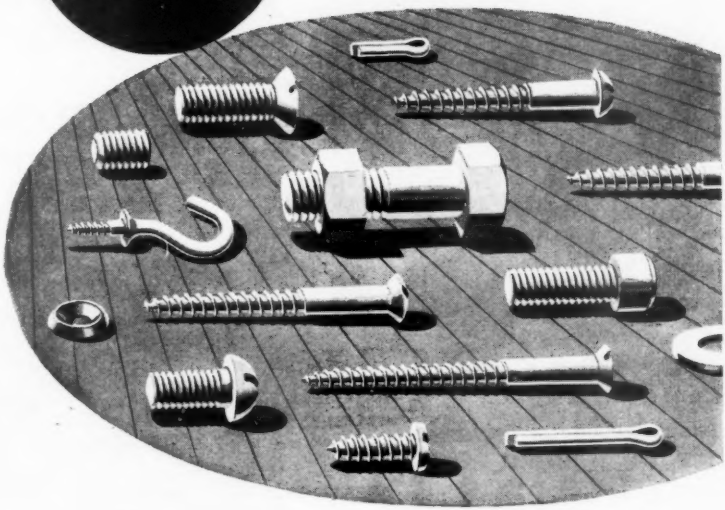

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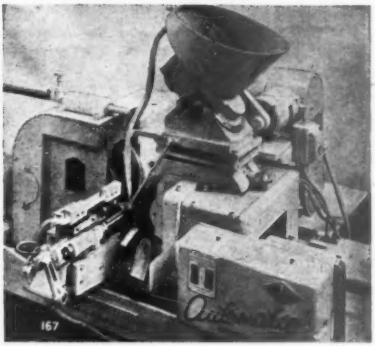

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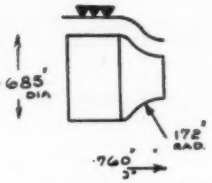

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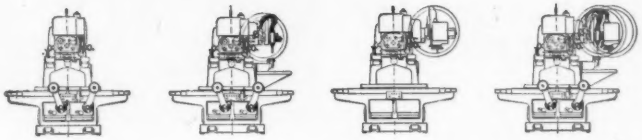

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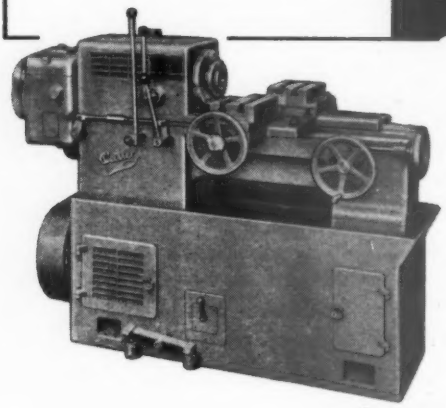

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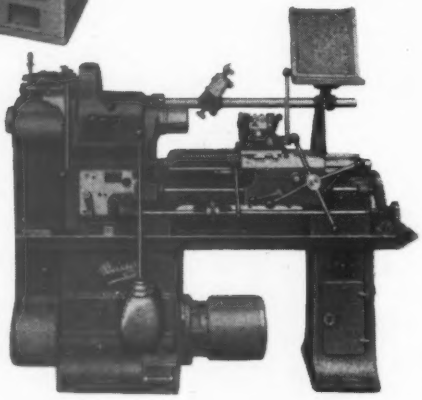

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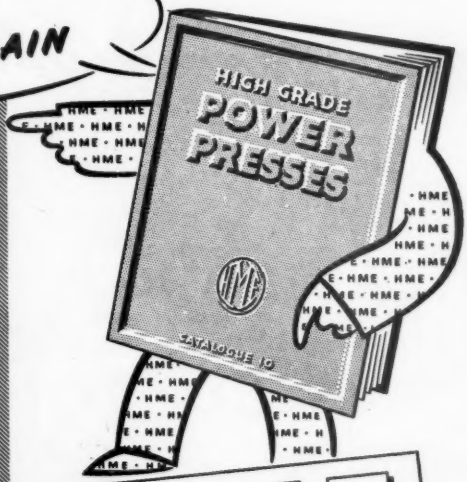

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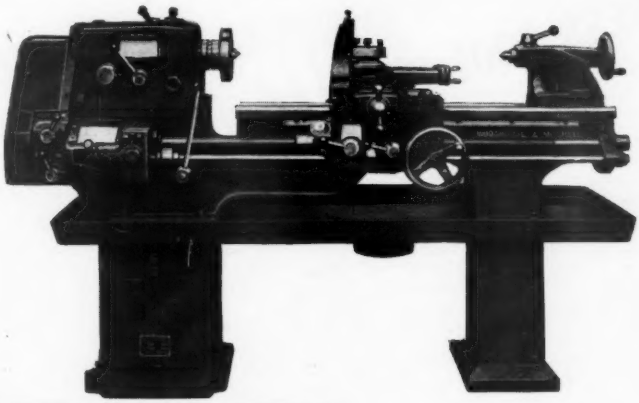

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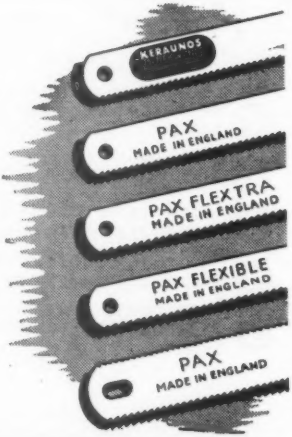

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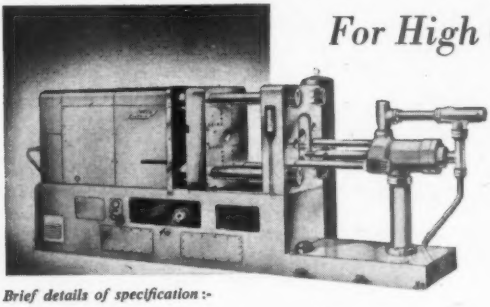

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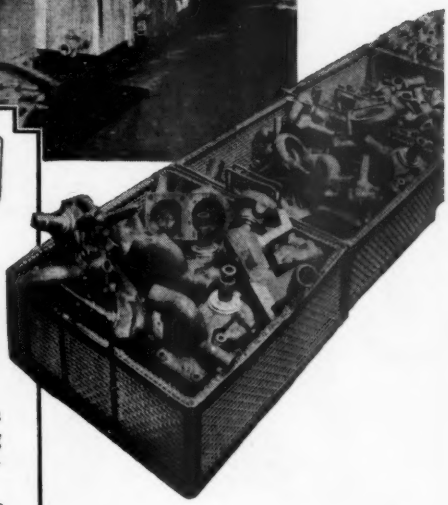

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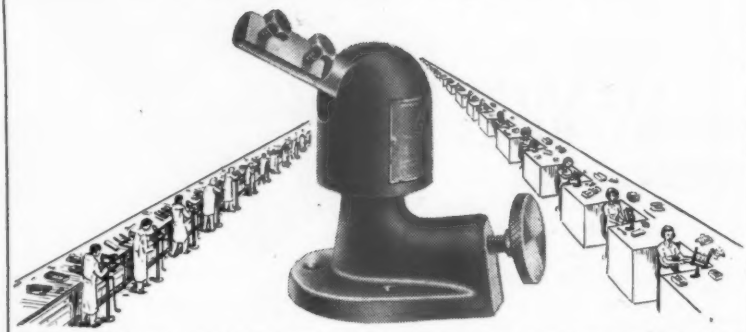

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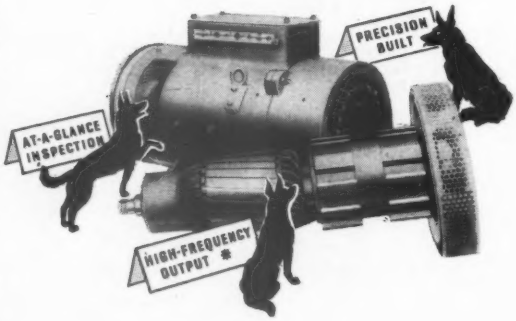

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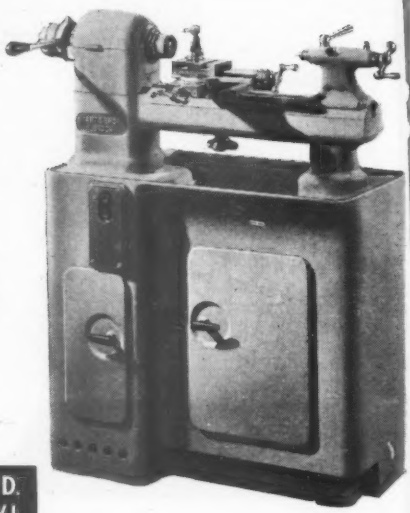

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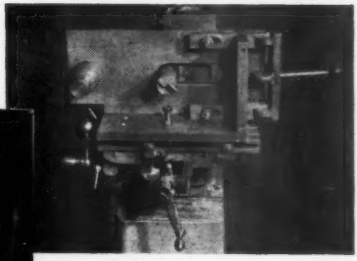

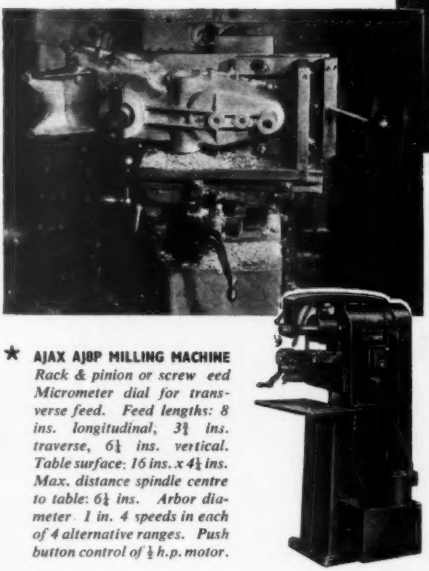

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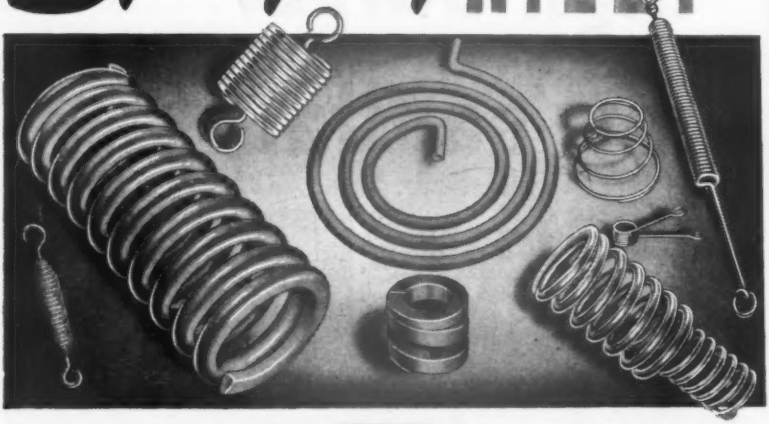

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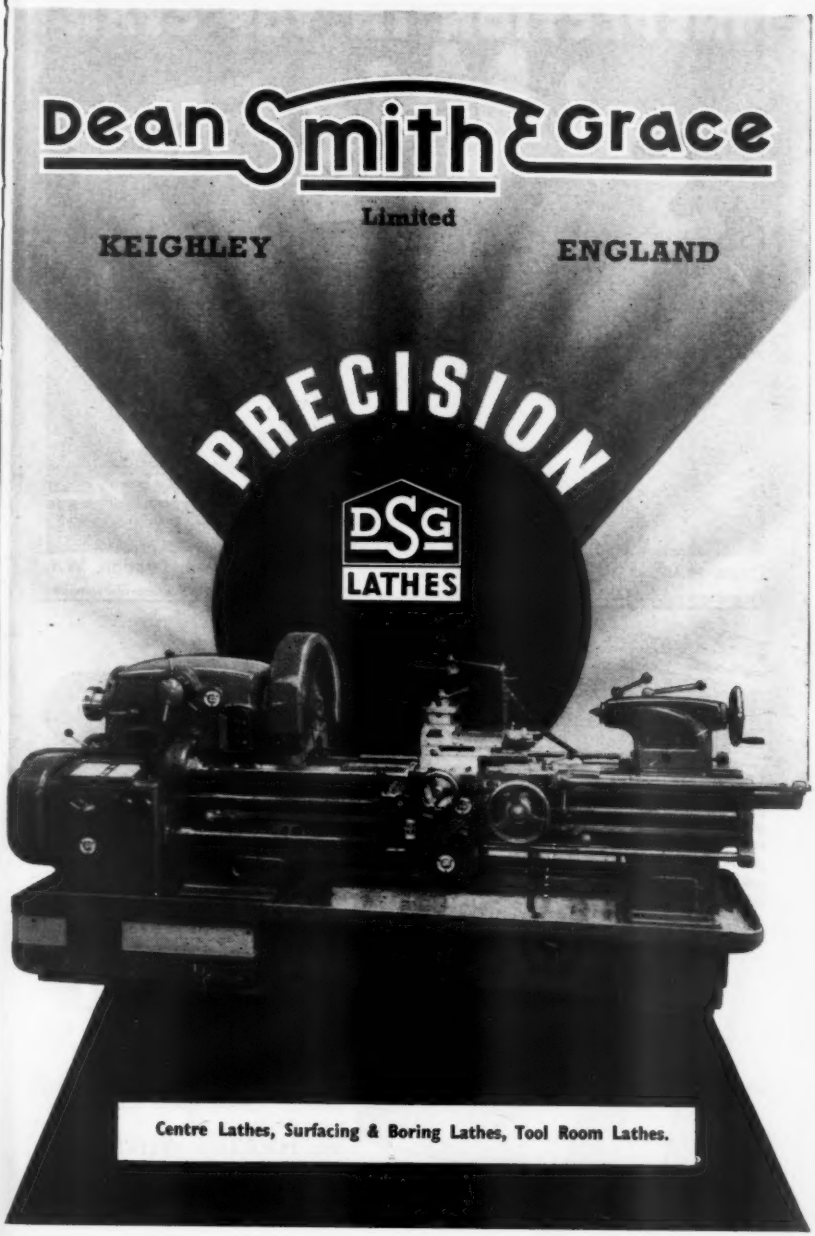
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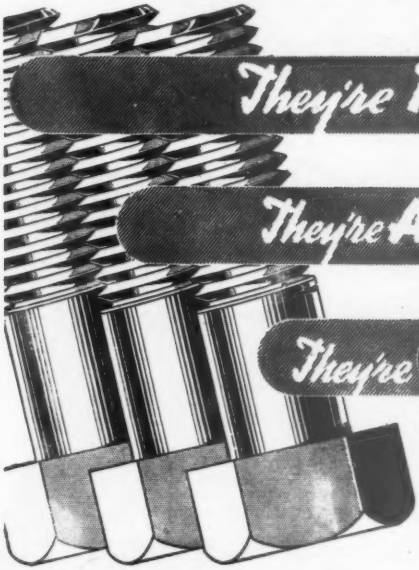

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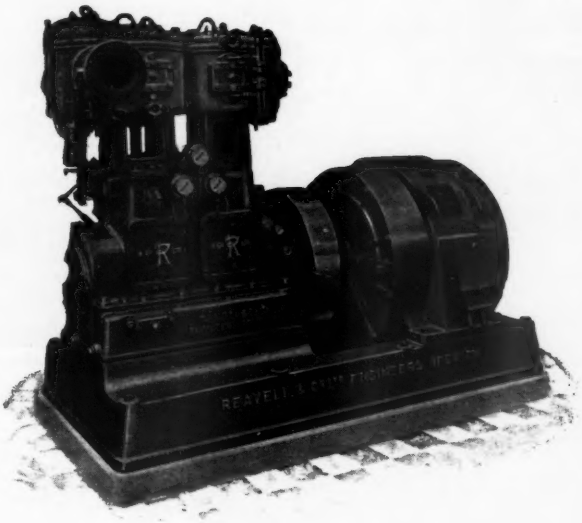

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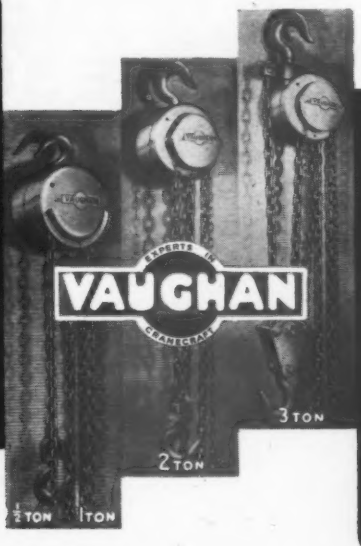

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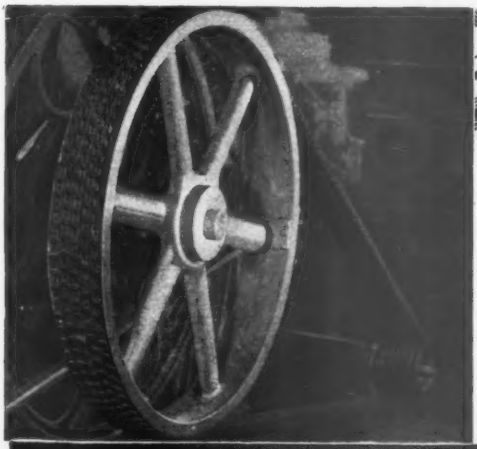

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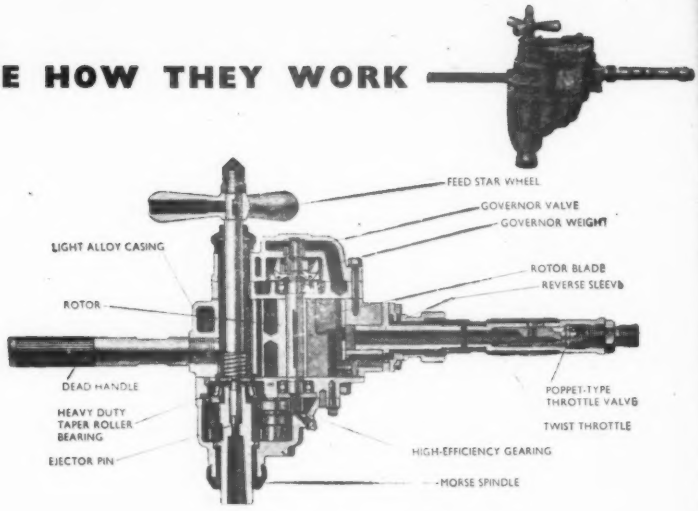

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